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ILLUSTRATIONS OF FUNGI—XXIII

WILLIAM A. MURRILL

In *Mycologia* for January, 1916, an index was given to the species illustrated in the first 22 articles of this series, the drawings of which were prepared by Mr. Edward C. Volkert. The plate accompanying the present article is from original studies by Miss Mary E. Eaton; and the descriptions are largely taken from Dr. Burlingham's monograph of the American species of *Russula* recently published in Volume 9, part 4, of *North American Flora*. For descriptions of the 13 species of *Russula* previously figured in this series, see *Mycologia* **4**: *pl. 68, 76,* and **7**: *pl. 160, 163.*

Russula delica Fries

SHORT-STEMMED RUSSULA

Plate 185. Figure 1. × 1

Pileus fleshy, of medium thickness, firm, broadly convex-umbilicate, then spreading, and at length infundibuliform, 8–16 cm. broad; surface white, sometimes with yellowish stains when the pileus has brought soil up with it, easily staining yellowish in drying, dry, glabrous or sometimes under the lens appearing obscurely tomentose from the pulling apart of the fibers in the outer layer; margin even, involute, late in expanding; context firm, white, unchanging where bruised, slowly becoming slightly acrid; lamellae white, the edges often becoming faintly glaucous-green when mature or in the process of drying, becoming yellowish where

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rubbed, some equal, some forking, narrowed at both ends, decurrent, subdistant to distant, rather narrow; spores subglobose, hyaline, tuberculate, 10 × 9 μ; stipe white, sometimes with a glaucous-green ring at the apex, glabrous or sometimes slightly downy at the apex under a lens, 2–5 cm. long, 1–2 cm. thick.

Found commonly in dry woods, especially under conifers, from Maine to Alabama and west to Colorado. It very much resembles *Lactaria piperata,* but is without milky juice and the hymenium is usually tinged with glaucous-green. Peck includes it in his list of edible fungi and remarks that it is excellent fried in butter. It is more compact and lasts longer than most species of *Russula.*

Russula flava Romell

YELLOW RUSSULA

Plate 185. Figure 2. × 1

Pileus fleshy, broadly convex, becoming plane or slightly depressed at the center, 5–8 cm. broad; surface flavous or golden-yellow, sometimes discolored with age, viscid when wet, glabrous; margin even to slightly striate when mature; context white, becoming gray with age and in drying, the taste mild; lamellae white, becoming pale-yellow, then gray with age, equal, not forking, adnexed, close, broader at the outer ends; spores pale-yellow, globose, echinulate, 8–9 μ in diameter; stipe white, becoming more or less gray with age or in drying, nearly equal, obscurely reticulate-rivulose, spongy, 5–8 cm. long, 1–2 cm. thick.

Found in mixed woods from New England westward to Michigan. Unfortunately, neither this species nor the two other beautiful yellow species, *Russula lutea* and *Russula flavida,* are very abundant.

Russula virescens (Schaeff.) Fries

GREEN RUSSULA

Plate 185. Figure 3. × 1

Pileus fleshy, globose, becoming convex, then nearly plane and often centrally depressed, 5–12 cm. broad; surface green or grayish-green, dry, with small, flocculose patches or warts resembling

those of *Venenarius;* margin even, rarely slightly striate in old specimens; context white, mild to the taste; lamellae white, a few short ones present, some forking, narrow toward the stipe and nearly or quite free, rather crowded; spores subglobose, echinulate, hyaline, $8 \times 7\,\mu$; stipe white, firm, nearly equal, 2.5–5 cm. long, 1.2–2 cm. thick.

Found in oak, maple, or mixed woods from Maine to Virginia and westward to Michigan and Ohio. This beautiful species has long enjoyed a reputation for edibility, but, unfortunately, it is rather rare and its flavor is not really of first rank. It may be recognized by the greenish color and warted appearance of its pileus. The pileus of *Russula furcata,* a bitter species formerly considered poisonous, is green but not warted. The green form of *Venenarius phalloides* and the poisonous *Entoloma lividum,* both common in Europe, are easily distinguished by other characters.

Russula obscura Romell

OBSCURE RUSSULA

Plate 185. Figure 4. × 1

A paler form of this species was figured and described in *Mycologia* for November, 1912. The color is usually dull-dark-red as here represented, the disk often being blackish. The species usually occurs on the ground in coniferous woods and is known from New England, New York, and Mississippi.

Russula compacta Frost & Peck

COMPACT RUSSULA

Plate 185. Figure 5. × 1

Pileus fleshy, broadly convex, sometimes umbilicate, becoming centrally depressed or infundibuliform, 7.5–15 cm. broad; surface white or whitish, becoming rusty-ochraceous, dry or subviscid after heavy rains, unpolished, glabrous, margin even; context compact, white, mild or slightly and tardily acrid, the odor in drying strong and disagreeable; lamellae white, becoming reddish-brown where wounded and smoky-brown in drying, unequal, oc-

casionally forked, rather crowded to subdistant, adnate or slightly rounded behind; spores globose to subglobose, nearly smooth, hyaline, 7 μ in diameter; stipe white but becoming stained with reddish-brown in handling or where wounded, and sometimes changing color like the pileus, equal or nearly so, solid, 3.5–6.5 cm. long, 1.2–2.5 cm. thick.

Found in pine groves or mixed woods in New England, New York, and New Jersey. Peck says it is edible. The flesh is firm as in *R. delica, R. nigricans,* and other members of the *Compactae.*

NEW YORK BOTANICAL GARDEN.

CULTURES OF UREDINEAE IN 1915[1]

J. C. Arthur

The present article is the fourteenth of a series of reports[2] by the writer upon the culture of plant rusts, beginning in 1899 and completing seventeen consecutive years. With this report it is proposed to bring the series to a close. Hereafter the record of such cultures as may be undertaken will be made in whatever connection may be found advantageous. To render the work brought together in the present series more readily accessible, and to make clear the changing point of view dominating the work, it is proposed to prepare an index and a brief historical statement, to be issued in the early future.

During the year 1915, little traveling was undertaken for the purpose of securing culture material and information. Two trips were made by the writer, the first one in April, the second in June, the first one in company with Mr. H. E. Ford, in order once more to explore the Kankakee marshes, in the northern part of Indiana, especially to gather information about *Puccinia Seymouriana* on *Spartina*. The rust was found in the greatest profusion, and specimens were taken from different parts of the region. Only one of these specimens showed viability, without much strength, and no infection was obtained from it. It is difficult to surmise what could cause such low viability, especially as the winter was mild and favorable to vegetation.

Correspondents in various parts of the country, as in previous years, have sent material for cultures, of both the rusts and the living host plants. A number of correspondents took extra trouble to respond to requests for particular species, and to such

[1] Presented before the Botanical Society of America at the Columbus meeting, December 30, 1915.

[2] See Bot. Gaz. **29**: 268–276; **35**: 10–23; Jour. Myc. **8**: 51–56; **10**: 8–21; **11**: 50–67; **12**: 11–27; **13**: 189–205; **14**: 7–26; Mycol. **1**: 225–256; **2**: 213–240; **4**: 7–33, 49–65; **7**: 61–89.

especially not only the writer feels much indebted but the scientific public is placed under obligation. Among those who contributed in more or less degree to the studies of the present year the following are especially entitled to mention: Messrs. F. McAllister, I. M. Lewis and B. C. Tharp, Austin, Texas; W. A. Archer, Mesilla Park, N. Mex.; J. M. Bates, Red Cloud, Neb.; E. Bartholomew, Stockton, Kans.; E. Bethel, Denver, Colo.; J. F. Brenckle, Kulm, N. Dak.; H. L. Bolley, Fargo, N. Dak.; J. J. Davis, Madison, Wis.; A. O. Garrett, Salt Lake City, Utah; H. D. House, Albany, N. Y.; H. S. Jackson, Corvallis, Ore.; C. H. Kauffman and E. B. Mains, Ann Arbor, Mich.; Roy Latham, Orient, N. Y.; W. H. Long, Albuquerque, N. Mex.; C. R. Orton, State College, Pa; J. L. Weimer and H. H. Whetzel, Ithaca, N. Y.

To indicate the extent of the work in making the cultures here reported the following statistics may be given. There were available 118 collections with resting spores, and 18 with active spores, *i. e.*, taken from growing plants. Over 240 tests were made in a hanging drop to determine the germinating condition of the spores. Only 48 collections of resting teliospores could be brought to germination, from which 110 sowings were made, and 16 infections secured. From the 18 collections of fresh spores 34 sowings were made, and 3 infections obtained No extra assistant was employed for the work, as has been customary in preceding years, but it was carried forward by the regular staff of the laboratory, the larger share falling to Mr. H. C. Travelbee.

NEGATIVE RESULTS.—A number of collections giving good germination of spores produced negative results when sown upon hosts which are presumably aecial hosts for the species, but possibly not adapted to the racial material in hand. A few collections of species, for which no definite suggestions were available, were sown upon the seemingly most likely aecial host. In both cases the lack of positive results appears worth recording.

1. PUCCINIA AMPHIGENA Diet., on *Calamovilfa longifolia* (Hook.) Hack., collected by Mr. E. Bethel at Colorado Springs, Colo., Oct. 18, 1914, and sent immediately to Lafayette, Ind.,

was sown March 31, on *Smilax hispida;* another collection from the same locality, made May 16, 1915, was sown on another plant of the same host May 24, both without infection. The leaves of the two collections sent by Mr. Bethel were thickly covered with the prominent, blackish telia. The teliospores germinated well, especially so in the October collection. Mr. Bethel stated on the label of the latter specimen that although the rust was very abundant, there were no *Smilax* plants in the region. In sending the May collection he stated on the label that the aecial stage occurred on *Leucocrinum,* but desired to have the material tested on *Smilax.* In the accompanying letter of same date he says: "I am inclosing *Puccinia amphigena* on *Calamovilfa longifolia,* which I wish you would sow on *Smilax,* which I believe you give as host in the east. I have fine young plants of native *Smilax,* but have failed to inoculate them. With us this does not normally belong to *Smilax,* and may be another race. It belongs to *Leucocrinum,* on which it is epidemic everywhere this year." This species of rust was first cultured on *Smilax* in 1902, from telial material gathered at Callaway, Neb., and in the year following from material gathered at the type locality in Chicago, Ill. It has been cultured altogether six times,[3] the westernmost locality for telial material being central Nebraska, on the plains, some two hundred miles from the foothills of the Rocky Mountains, where this season's material was obtained.

2. PUCCINIA EMACULATA Schw., on *Panicum capillare* L., collected at Lafayette, Ind., was sown, May 21, on *Euphorbia corollata,* having shown strong germination, but without results. The reasons for this attempt, with citation of other trials, are given in the previous report of cultures.[4]

3. PUCCINIA SIMILLIMA Arth., on *Phragmites communis* Trin., collected by Dr. J. F. Brenckle, at Wiedmer's Lake, N. Dak., on April 11, 1915, was sown May 14, on *Anemone cylindrica* and *Ranunculus acris,* without infection. It was sown again June 18 on two plants of *Ranunculus sceleratus,* but with no infection.

[3] See Bot. Gaz. **35**: 20. 1903; Jour. Myc. **10**: 11. 1904; **12**: 16. 1906; **14**: 15. 1908; Mycol. **2**: 225. 1910; and **4**: 18. 1912.

[4] Mycol. **7**: 65. 1915.

This species was successfully cultured in 1902 and again in 1907 on *Anemone canadensis*.[5] A recent monographic study of American grass rusts confirms the early opinion[6] that this species is similar, morphologically and in host requirements, to *P. Magnusiana* of Europe, which has been found to have aecia on *Ranunculus acris* and *R. bulbosus*. Aecia were collected by Dr. Brenckle on *R. sceleratus*, May 30, 1908, near Kulm, N. Dak., which are structurally similar to the American form on *Anemone*, as well as to the European form on *Ranunculus*. An appeal to Dr. Brenckle for living plants of *R. sceleratus* was met with some difficulty upon his part, but successfully, and telial material also was sent from a locality not far away from the place where aecia on *R. sceleratus* had been obtained, but nothing definite has been proven. It still seems probable, however, that *P. simillima* is but a racial variant of *P. Magnusiana*, and that a race may finally be found in America with aecia on *Ranunculus*, although the common form is on *Anemone*.

4. PUCCINIA RHAMNI (Pers.) Wettst., on *Nothoholcus lanatus* (L.) Nash (*Holcus lanatus* L.), sent by Prof. H. S. Jackson from Corvallis, Ore., was sown April 2 on *Rhamnus cathartica* and *Lepargyraea canadensis*, with no infection. Another collection of the rust on *Scolochloa festucacea* (Willd.) Link, sent by Dr. J. F. Brenckle from Kulm, N. Dak., was sown May 8 on *Lepargyraea canadensis* and *Eleagnus argentea*, and again May 21 on *Rhamnus cathartica*, all without infection. Aecia are known to be common about Corvallis on *Rhamnus Purshiana*, but not found on *Lepargyraea*, the host being absent from the region, while at Kulm aecia are common on *Eleagnus*, but whether the latter belong to a race of *P. Rhamni*, or to an independent species is not yet known.

5. PUCCINIA AGROPYRI E. & Ev., on *Hordeum jubatum* L., sent by Dr. Brenckle from Wiedmer's Lake, N. Dak., was sown May 13 on *Anemone cylindrica*, *Clematis ligusticifolia*, and *Aquilegia* sp., without infection. Recent monographic study of the

[5] Bot. Gaz. **35**: 20. 1903; and Jour. Myc. **14**: 15. 1908.

[6] Arthur, The Uredineae occurring upon *Phragmites*, *Spartina* and *Arundinaria* in America. Bot. Gaz. **34**: 18. 1902.

grass rusts has shown the probability that this form, usually reported under the name *P. rubigo-vera*, is a part of the comprehensive species, *P. Agropyri*, with aecia on different Ranunculaceous hosts, forming well defined races.[7]

6. UROMYCES SCIRPI (Cast.) Burr., on *Scirpus fluviatilis* (Torr.) A. Gray, sent by Dr. J. F. Brenckle from Kalmbach Lake, Lamoure Co., N. Dak., was sown March 26 on *Sium cicutaefolium* and *Hydrocotyle australe*, and again May 19 on other plants of the same two species, without infection. The species apparently is made up of races, a study of which was the aim in this attempt at cultures.[8]

7. UROMYCES ARCHERIANUS Arth. & Fromme, on *Chloris elegans* H. B. K., collected Nov. 12, 1914, and again Feb. 7, 1915, by Mr. W. A. Archer, at Mesilla Park, N. Mex., was sown April 15, each collection on a different plant of *Chenopodium album*, with no infection. This new species of rust was discovered in abundance upon the campus of the New Mexico Agricultural College, with no distinctive aecia in the vicinity. Because of its morphological resemblance to *Uromyces Peckianus*, it was tried upon *Chenopodium*.

8. AECIDIUM IRIDIS Ger., on *Iris versicolor* L., from the Renwick Swamp, Ithaca, N. Y., was sent by Mr. J. L. Weimer in abundance and in excellent condition, and on July 1, the third day after collection, was sown on a large and especially thrifty plant of the same species of *Iris*, but gave no infection. A test of the spores showed that seventy-five to ninety per cent. were in germinating condition. Field observations have given little or no grounds for considering this rust autoecious, and the present trial further emphasizes this view. However, up to the present time no one has detected a probable alternate host.

SUCCESSFUL CULTURES SUPPLEMENTING PREVIOUS WORK.—The facts derived by growing the following species of rusts supplement in a variety of ways the facts obtained from previous cultures in this series from cultures recorded by other American

[7] For previous attempts at cultures see Mycol. **2**: 219. 1910.

[8] For previous culture work see Jour. Myc. **13**: 199. 1907; **14**: 17. 1908; Mycol. **1**: 237. 1909; and **7**: 83. 1915.

or European investigators. The extension of aecial hosts for *Puccinia Seymouriana* to two families not closely related to the one previously known is especially important, and the behavior of rye rust upon *Anchusa* appears to have significance.

1. PUCCINIA EXTENSICOLA Plowr. (*P. Dulichii* Syd.).—A collection of this rust on *Dulichium arundinaceum,* made at DeMotte, in the Kankakee marshes of northern Indiana, by Mr. H. E. Ford and the writer on April 6, 1915, was sown April 19, on two plants of *Aster paniculatus,* one brought from the spot where the collection was made, and the prevailing plant at the place, and also on a plant of *Solidago canadensis.* Abundant pycnia began to show on the *Solidago* April 26, and aecia May 9, while the two *Aster* plants were unaffected. The result agrees with the facts obtained in 1914[9] with similar material from Florida.

2. PUCCINIA GROSSULARIAE (Schum.) Lagerh.—Material collected by Mr. Roy Latham at Greenport, Long Island, N. Y., on *Carex tenuis,* was sown March 25 on *Ribes floridum* with no infection, and March 31 on *R. Cynosbati,* giving rise to pycnia April 13, and aecia May 4. The aeciospores thus produced were sown May 4 on *Carex pubescens,* with no infection. Another collection made by C. H. Kauffman and E. B. Mains at Lake Placid, N. Y., on *Carex arctata,* was sown March 15, on *Ribes Cynosbati,* giving a few pycnia March 26, but failing to develop further on account of injury to host. The same material was sown again March 26 on another plant of the same sort, giving pycnia April 2, and aecia April 26, the growth being slow. Both the original telial collections gave many urediniospores, all of which appeared to have but one basal pore, and they may be considered pure representatives of *Puccinia uniporula* Orton. The aecia were not distinguishable from those grown in previous years from material showing equatorially three-pored urediniospores. It was hoped that aecia so grown might be carried back to the telial host, and the character of the resulting urediniospores ascertained, but although an attempt was made, it failed.

A collection of aecia on *Ribes longiflorum* sent from Denver, Colo., by Mr. E. Bethel, was sown June 4, two days after collec-

[9] Mycol. 7: 81. 1915.

tion, upon *Carex durifolia,* a species from which the aecia were supposed to have been derived, and also upon *C. Jamesii,* with no infection.[10]

3. PUCCINIA ERIOPHORI Thüm.—Observations by Dr. H. D. House of the New York State Museum, made near Oneida, N. Y., in June of this year, led to the recognition of this species of rust in America and the discovery of the alternate stage. On June 27 Dr. House wrote that "of thousands of plants of *Senecio* in the marsh practically every one is affected by the *Aecidium.*" He found that of the numerous marsh plants the one having a corresponding abundance of rust on the dead leaves from the preceding year was *Eriophorum viridi-carinatum.* At the same time he sent growing plants of both the *Senecio* and *Eriophorum,* the former with leaves well spotted with aecia. All the plants continued to flourish.

On June 30 a sowing of aeciospores from *Senecio aureus* was made on the young leaves of *Eriophorum viridi-carinatum.* After twenty-four hours a test of the spores remaining on the leaves of the *Eriophorum* showed that from twenty to forty per cent. of them were germinating. Daily observation of the plant was not made, but on July 15 both uredinia and telia were found to be present. The rust on American species of *Eriophorum* is morphologically very similar to *Puccinia angustata* Peck on various species of *Scirpus,* and usually has been listed under that name. As *P. angustata* has its alternate stage on the labiate, *Lycopus,* the same had been supposed to be true of the rust on *Eriophorum,* and thus to differ from the similar rust in Europe.

Tranzschel[11] has reported the infection in 1907 of *Ligularia sibirica* (*Senecio cacaliaefolius*) and *Senecio paluster* (*Cineraria palustris*) from teliospores on *Eriophorum angustifolium,* and has listed the European stations for the rust, showing that it is quite rare. In America it has been taken on *Eriophorum angustifolium* Roth, at Decorah, Iowa, June 29, 1884, *E. W. D. Holway,* Kennedy, Neb., July 20, 1892, *J. M. Bates,* Newfane, Vt., Oct. 16,

[10] For previous cultures see Jour. Mycol. **12**: 58. 1905; **12**: 14. 1906; **13**: 196. 1907; **14**: 13. 1908; Mycol. **4**: 13. 1912; and **7**: 66, 78. 1915.

[11] Beiträge zur Biologie der Uredineen, III.

1892, *A. J. Grout;* on *E. polystachyon* L., Mt. Hood, Ore., at 5,000 feet altitude, July 23, 1915, *H. S. Jackson;* on *E. tenellum* Nutt., at Isle au Haute, Me., Sept. 11, 1899, *J. C. Arthur;* on *E. virginicum* L., at Avilla, Ind., August, 1884, *W. B. VanGorder,* Granville, Mass., August 1889, *A. B. Seymour* (Seym. & Earle, Econ. Fungi *54*), Isle au Haute, Me., Sept. 6, 1899, *J. C. Arthur,* Central Village, Conn., Aug. 20, 1900, *John L. Sheldon,* Jackson, Ind., July 28, 1905, *C. C. Deam,* Elm Lake, Wis., Sept. 12, 1907, *C. L. Shear,* Winona Lake, Ind., Aug. 26, 1914, *G. N. Hoffer;* on *E. viridi-carinatum* (Engelm.) Fernald, at Avilla, Ind., August, 1884, *W. B. VanGorder,* Oneida, N. Y., June 27, 1915, *H. D. House;* on *Senecio aureus* L., at Buffalo, N. Y., without date, *G. W. Clinton,* Decorah, Iowa, June, 1883, *E. W. D. Holway,* Ann Arbor, Mich., June 8, 1898, *C. H. Kauffman,* Mt. Chocorua, N. H., July 3, 1906, *W. G. Farlow,* Radisson, Wis., July 6, 1906, *J. J. Davis,* Merrimac, Wis., June 19, 1912, *Davis & Arthur,* Oneida, N. Y., June 27, 1915, *H. D. House;* on *S. ductoris* Piper, Mt. Hood, Ore., at 5,000 feet altitude, July 23, 1915, *H. S. Jackson.* It is evident that the rust is widespread in America, especially northward, but not particularly abundant, and the aecia have been collected over nearly the same territory as have the telia.

The morphological differences between *P. angustata* and *P. Eriophori* are very considerable in the aecia, and while less marked in the uredinia and telia are yet noticeable. The urediniospores of *P. Eriophori* are more globoid, while the teliospores are somewhat shorter (35–60 μ long, against 42–67 μ in *P. angustata*) and the apex thinner (4–10 μ, against 7–16 μ in the other) with more tendency to acuteness.

4. PUCCINIA AGROPYRI E. & Ev. (*P. alternans* Arth.)—A collection on *Festuca Thurberi* Vasey, sent from Lake Eldora, Colo., by Mr. E. Bethel, was sown May 13, on *Anemone cylindrica, Aquilegia canadensis, Clematis ligusticifolia,* and *Thalictrum dioicum.* Infection was obtained on the last named host only, which began to show pycnia May 23, and aecia May 30. In sending this material Mr. Bethel wrote that he thought it had been derived in the field from aecia on *Thalictrum Fendleri,* which the culture confirms as highly probable. The first collection of this

kind sent the writer by Mr. Bethel was dated Sept. 17, 1910, and was intended for cultures on *Thalictrum*. This could not be made to germinate when time for culture work arrived, nor could a half dozen other collections sent subsequently at various dates. With a specimen dated April 5, 1912, Mr. Bethel states that he has "proven by most positive field cultures" that it goes to *Thalictrum Fendleri*. Again in May, 1915, Mr. Bethel sent fine material from his garden, showing the telia that had been brought there and the aecia on *Thalictrum* derived therefrom. The reasons for listing the *Thalictrum* form under *P. Agropyri* were stated in the last report.[12] The aecia are especially large and prominent in this particular race on *Festuca*, as shown by a number of collections sent from the same locality.

5. PUCCINIA ASPERIFOLII (Pers.) Wettst.—Two plants of *Anchusa officinalis* L. were given ample space in the experimental garden of the Indiana Experiment Station and attained a fine development, each plant measuring five or six feet across. On July 2, the weather being especially damp with occasional light showers, stems of rye, heavily infested with rust, were laid upon the two plants in the garden, doubtless a hundred or more stems to each plant. The plants were not covered in any manner. The date of the appearance of the first pycnia was not recorded, but on July 13, the plants were conspicuously dotted with yellow spots bearing groups of pycnia. About a week later careful search brought to light two groups of aecia. Although the vigor of the plants and the condition of the weather seemed favorable, and the great numbers of yellow spots with their groups of pycnia continued to show, yet no further development of the rust took place.[13]

The reason why the infection should have started out with such marked vigor and yet failed to mature aecia is not at all apparent. The weather for the whole period was favorable for aecial growth. It is possible, and yet scarcely probable, that the explanation lies in the lessened vigor for the American rye rust, which is propagated by repeating spores alone, the aecial hosts being practically wanting in America.

[12] Mycol. 7: 74. 1915.

[13] For a previous culture of similar character see Mycol. 1: 236. 1909.

6. PUCCINIA SEYMOURIANA Arth. (*Aecidium obesum* Arth.).—This rust on *Spartina* at the time it was described in 1902 was predicted upon morphological and geographical grounds to have its alternate form upon the Rubiaceous genus *Cephalanthus*,[14] the prediction being established by cultures in 1905, and confirmed in subsequent seasons.[15] It was not until June, 1913, that additional suggestions came to light, when Rev. J. M. Bates wrote that his observations in the field led him to believe that in Nebraska this rust on *Spartina* was connected with an *Aecidium* on *Apocynum hypericifolium*. He sent a specimen of the aecia, which proved to be *Aecidium obesum* Arth. This collection was distributed as *4103* of Barth. Fungi Columbiani, and *1301* of Barth. N. Amer. Ured. Later in the year a careful microscopic comparison of these aecia with those on *Cephalanthus* established their essential similarity. Owing to adverse seasonal conditions Mr. Bates was unable to supply culture material for the 1914 cultures, but on May 8, 1915, he sent telial material on *Spartina Michauxiana* from Eight Mile Creek, near Red Cloud, Neb. It was sown May 12, on *Apocynum cannabinum, Amsonia salicifolia, Asclepias syriaca*, and *Cephalanthus occidentalis*, producing a scanty infection only on *Apocynum*, pycnia showing June 10, but without developing aecia.

A specimen of aecia on *Asclepias pulchra*, collected by Mr. Roy Latham, of Orient, N. Y., June 29, 1914, was reported to the collector upon cursory examination only, as aecia of *Puccinia Jamesiana*, that being the only species at that time known to have aecia with a limited mycelium on *Asclepias*, and it was suggested that he search for telial material on *Bouteloua*. Not long afterward he wrote that *Bouteloua* was not known upon Long Island, and that among the infected milkweeds, which occur on "a patch about 100 feet in length by 25 in width, many plants being actually covered from ground up, stem, leaves, and all," the only grass or sedge bearing rust was *Spartina cynosuroides*, of which he sent leaves covered thickly with telia remaining over from the preceding year, and young leaves of the season with uredinia. The *Spartina* rust

[14] Bot. Gaz. 34: 13. 1902.

[15] Jour. Myc. 12: 24. 1906; Mycol. 1: 236. 1909; 4: 19. 1910.

proved to be *P. Seymouriana*, and the aecia on *Asclepias* resembled those belonging to that species. Mr. Latham kindly sent viable material for cultures, collected at the same spot June 2, 1915, which was sown June 10 on plants of the four hosts used in the previous culture. Only *Asclepias syriaca* became infected, showing an abundance of pycnia June 17 and great numbers of aecia June 23.

It may fairly be concluded that this species of rust is one composed of well-marked races in accordance with the aecial hosts. Besides the three races here indicated, another doubtless occurs in connection with *Amsonia*, the characteristic aecia having been found on this host from Missouri.

7. PUCCINIA SUBNITENS Diet.—A collection of this rust on *Distichlis spicata*, very common in alkaline regions, was sent by Prof. H. S. Jackson from LaGrand, Ore., and sown April 15, on *Chenopodium album*. Pycnia began to show April 25, and aecia May 8, chiefly on the petioles of the leaves.[16] Telial material has now been cultured from the states of Nebraska, Colorado, Delaware, Nevada, and Oregon, extending from the Atlantic to the Pacific coasts.

8. PUCCINIA WINDSORIAE Schw.—Much attention has been given to finding the telial host for the aecia on *Dirca palustris*, beginning with the illusory success of 1903 and continuing to the present time.[17] Many telial collections have been used, secured from widely separated localities, and representing many species of rusts. During the last year a search through the herbarium for aecia on other hosts, having similar microscopic characters, led to the possibility that it might be a racial part of the common *Puccinia Windsoriae*. To test this hypothesis telial material was secured near Lafayette, on *Tridens flavus*, from the vicinity of *Dirca* bushes, annually showing the lemon-yellow spots carrying the aecia. Sowings were made May 3, on *Dirca palustris*, May

[16] For previous cultures see Bot. Gaz. **35**: 19. 1903; Jour. Myc. **11**: 54. 1905; **12**: 16. 1906; **13**: 197. 1907; **14**: 15. 1908; Mycol. **1**: 234. 1909; **2**: 225. 1910; and **4**: 18, 54. 1912.

[17] For previous attempts see Jour. Myc. **10**: 19. 1904; **11**: 56. 1905; **13**: 191, 192, 196. 1907; **14**: 12. 1908. Mycol. **1**: 231. 1909; **2**: 219, 227. 1910; **4**: 9, 10, 11, 12. 1912; **7**: 64, 65. 1914.

22, on *Dirca* and *Ptelea trifoliata,* May 24, on *Ptelea.* Only on *Ptelea* was infection secured, abundant pycnia showing from both sowings June 2, and aecia June 7.[18]

SUCCESSFUL CULTURES REPORTED NOW FOR THE FIRST TIME.—The following species have never before been cultivated in America or elsewhere, so far as the writer knows.

1. PUCCINIA TUMIDIPES Peck.—Excellent telial material of this species on *Lycium pallidum,* was sent by Mr. W. A. Archer, collected in the Organ Mountains, N. Mex., on Oct. 9, 1914. As it was found the teliospores would germinate, it was sown Dec. 1, 1914, on plants of *Lycium vulgare,* giving a few pycnia only by Dec. 18, with no further development, possibly owing to the poor condition of the host plant. It was sown again on another plant of the same sort Dec. 12, 1914, giving rise to a few groups of pycnia by Dec. 21, and a single uredineal sorus Jan. 16, 1915.

Although the growth of the fungus was not vigorous, and did not continue to the final stage, yet it seems safe to conclude that the rust is autoecious, and without cupulate aecia. It clearly belongs in the genus *Bullaria,* where it becomes **B. tumidipes** (Peck) comb. nov.

2. PUCCINIA DISTICHLIDIS Ellis & Ev.—This rust in the first place was sent to Mr. Ellis in 1891 by F. D. Kelsey of Helena, Mont., and labeled as on *"Distichlis maritima,"* but afterward was shown by the writer[19] to be on *Spartina gracilis.* On account of this erroneous determination of the host plant, the rust was renamed *P. Kelseyi* by Sydow.[20] In a study of "Correlation between certain species of Puccinia and Uromyces" Orton[21] came to the conclusion from a comparison of the morphological characters and geographical distribution of *Uromyces Spartinae* and the rust in hand, that it was "extremely probable that its aecial host is some member of the primrose family, perhaps *Steironema,*" this being one of the aecial hosts for the *Uromyces.* It has been

[18] For previous successful cultures see Bot. Gaz. **29**: 273. 1900; **35**: 16. 1903; Jour. Myc. **11**: 56. 1905.

[19] Bull. Lab. Nat. Hist. Univ. Iowa **5**: 324. 1902.

[20] Sydow, Monog. Ured. **1**: 806. 1904.

[21] Mycol. **4**: 202. 1912.

difficult to locate this rust in localities from which culture material could be secured. Dr. Brenckle sent material from Kulm, N. Dak., from which cultures were attempted in 1909 and 1910[22] upon a score of different hosts, but not including *Steironema*. Again material on *S. Michauxiana* was obtained from Dr. Brenckle, collected April 8, 1915, at Kulm, N. Dak., and also from Rev. J. M. Bates, collected April 20, 1915, at Loup City, Neb.

The North Dakota material was sown May 8, on *Steironema ciliatum*, and pycnia began to show May 16, followed by an abundance of aecia May 22. The Nebraska material was sown May 8, on *Steironema ciliatum* and *Polemonium reptans*. The *Polemonium* plant remained uninfected, but many pycnia began to show on the *Steironema* May 14, followed by a great abundance of aecia May 20. Although these cultures were exceedingly vigorous and in so far seemed beyond question, yet there exists a possible small source of error. The correlated *Uromyces* is a common rust, and occasionally grows upon the same leaves with the *Puccinia*. In the Nebraska material no admixture could be found, but there were sori of *Uromyces* on the North Dakota material. Care was exercised, however, to avoid all sori with one-celled spores in making the cultures, and as the two forms were mostly on separate leaves, there is little reason to doubt that the cultures were pure. Correctness of the general conclusion was obtained from a wholly independent source, however, when Dr. Brenckle sent a collection of aecia on *Steironema ciliatum*, made by Prof. O. A. Stevens near Fargo, N. Dak., May 23, 1915. On June 5 Dr. Brenckle accompanied Prof. Stevens to the spot where the collection was made, to institute a search for *Spartina*, as Prof. Stevens had reported that the grass did not grow within miles of the place. Dr. Brenckle writes, June 16, that he "found a small isolated bunch of *Spartina* in the midst of the infected spot; the rust on the *Spartina* was *Puccinia!*" The collection of aecia has been issued as Fungi Dakotenses *316*, under the name of *Puccinia Distichlidis*. This is the only field collection of aecia positively known to belong to the *Puccinia* form.

3. PUCCINIA MONTANENSIS Ellis.—There has been much con-

[22] Mycol. 2: 219. 1910; 4: 11. 1912.

fusion in the application of this name. Not until within the present year has it been possible to secure a clearly defined set of characters with which to delimit the species, especially to distinguish it from *Puccinia Agropyri* E. & E., with which it often grows, and which it resembles in gross appearance. It is now found to be separable from *P. Agropyri*, by the slightly thinner-walled urediniospores, having more pores (8 to 10, instead of 6 to 8 in *P. Agropyri*), sometimes accompanied by paraphyses, but more especially by the far broader teliospores (18 to 34 μ wide, against 13–24 μ in the other species), which generally approximate an oblong form with convex sides, in contrast with terete spores usually with straight sides in *P. Agropyri*.

The rust in question has often been labeled *P. apocrypta* E. & T. The type of *P. apocrypta* was collected at Canon City, Colo., August 21, 1887, and was recorded as on *Asprella Hystrix*. The type collection is now in the herbarium of the Missouri Botanical Garden, and has been carefully examined by a number of students of the grasses. The specimen is scanty, and consists of leaves only. It can not be the species of grass named, which does not occur within the region. It seems most likely to be some species of *Sitanion* possibly *S. elymoides*, a common species of the region much resembling *Hystrix*. The rust is certainly *P. Agropyri*, although the teliospores are rather broader than usual. The type material of *P. montanensis*, which is in the herbarium of the New York Botanical Garden, has been examined and bears out the published statement that it is on *Elymus condensatus*. It was collected at Helena, Mont., July 25, 1891, by F. D. Kelsey.

The fortunate observation which led to the elucidation of this species was made by Mr. A. O. Garrett, of Salt Lake City, Utah, who wrote on May 23, 1915: "I am sending by this mail some leaves of *Hydrophyllum* [*capitatum*] heavily infected with *Aecidium Hydrophylli*. I think this rust has the alternate stage on *Agropyron*. I always find the *Agropyron* plant plentiful, and it is affected by the rust, wherever the Hydrophyllums grow." The aecia on *Hydrophyllum* sent by Mr. Garrett came in good condition, and were sown May 28, on *Agropyron tenerum* and *Elymus virginicus*. Uredinia began to show in abundance June 7, on the

Agropyron, followed by telia June 11. On the *Elymus* only a few uredinia developed, not observed until June 23. A study of the uredinia and telia on the *Agropyron* disclosed the characters of *Puccinia montanensis.* Field observations by Dr. Brenckle of North Dakota, Mr. Garrett of Utah, and Mr. Bethel of Colorado, independently reported, associated aecia on *Lithospermum, Onosmodium,* and *Phacelia,* with *Agropyron* and *Elymus* rust, but material sent to establish the connection by cultures failed to yield results. Subsequent herbarium studies leave little chance for doubt that *Puccinia Agropyri* has its alternate form on Ranunculaceous hosts, while *P. montanensis* has its alternate form on Hydrophyllaceous and Borraginaceous hosts.

Two former attempts at culture of *P. montanensis*[23] are shown by a reexamination of the original material to have been made by using *P. Agropyri,* and not *P. montanensis,* as published.

4. UROMYCES HORDEI Tracy.—Telial material on *Hordeum pusillum* Nutt., sent by F. McAllister and B. C. Tharp from Austin, Texas, was sown March 15, on *Nothoscordium striatum* and *Ornithogalum umbellatum,* and again March 30 on the latter host, with infection only on the *Nothoscordium,* showing pycnia March 30, and aecia April 6, both strongly developed.

When the report of culture experiments for the years 1911 to 1913 by W. Tranzschel[24] came to hand, the account of the successful growth of barley rust on *Ornithogalum umbellatum* suggested the renewal of a study of the correlated American species of *Uromyces, U. Hordei* Tracy. There is no morphological difference between the uredinia and telia of the latter species and those of *Puccinia anomala* Rostr. (*P. simplex* Eriks. & Henn.), except that part, rarely all, of the teliospores of the *Puccinia* are two-celled. *Ornithogalum umbellatum* is the Star-of-Bethlehem of the florists, and has escaped from gardens and become a weed in the southern states as far northward as the Ohio river. Aecia on it have not been reported for America, but they are known on a near relative, *Nothoscordium bivalve* (L.) Britton (*Ornithogalum bivalve* L.), from Texas. An appeal to Dr. McAl-

[23] Jour. Myc. 14: 11. 1908; and Mycol. 1: 11. 1912.

[24] Mycol. Centr. 4: 70. 1914.

lister and Mr. Tharp, of the University of Texas, made in November, 1914, soon placed in my possession resting telia on *Hordeum pusillum* and dormant bulbs of the *Nothoscordium*, which were made to yield the above results.

In the meantime it was remembered that Mr. W. H. Long had reported this connection several years before. In a letter dated Feb. 28, 1904, he says: "I have successfully grown *Uromyces Hordei* urediniospores from sowings of aeciospores that I find on *Nothoscordium striatum* [*N. bivalve*]." Again on March 24, 1910, Mr. Long wrote: "Since writing you last I have cross-inoculated teliospores on *Nothoscordium striatum*, and aeciospores from it upon *Hordeum nodosum* [error for *H. pusillum*], and got successful cultures in both instances." Mr. Long kindly sent material to illustrate his work and also material with which to verify his conclusions. Unfortunately it was not possible to bring about conditions for the cultures, and as Mr. Long's work was done in the open, and not verified by others, the results were omitted from the North American Flora when this species was reached.[25]

In this connection it may be well to say that the statement in the North American Flora that the species occurs in California on *Hordeum nodosum* is erroneous. The species ranges from Nebraska to Mississippi and Texas, which also includes the range of the aecial host, although the aecia have only been taken in Texas.

SUMMARY

The following is a complete list of the successful cultures made during the year 1915. It is divided into two series, species that have previously been grown in cultures and reported by the writer or other investigators, and species whose culture is now reported for the first time.

A. SPECIES PREVIOUSLY REPORTED

1. PUCCINIA EXTENSICOLA Plowr. (*P. Dulichii* Syd.).—Teliospores from *Dulichium arundinaceum* (L.) Britt., sown on *Solidago canadensis* L.

[25] N. Amer. Flora 7: 228. 1912.

2. PUCCINIA GROSSULARIAE (Schum.) Lagerh. (*P. uniporula* Orton).—Teliospores from *Carex tenuis* Rudge, and from *C. arctata* Boott, sown on *Ribes Cynosbati* L.

3. PUCCINIA ERIOPHORI Thüm.—Aeciospores from *Senecio aureus* L., sown on *Eriophorum viridi-carinatum* (Engelm.) Fernald.

4. PUCCINIA AGROPYRI Ellis & Ev. (*P. alternans* Arth.).—Teliospores from *Festuca Thurberi* Vasey, sown on *Thalictrum dioicum* L.

5. PUCCINIA ASPERIFOLII (Pers.) Wettst.—Teliospores from *Secale cereale* L., sown on *Anchusa officinalis* L.

6. PUCCINIA SEYMOURIANA Arth. (*Aecidium obesum* Arth.).—Teliospores from *Spartina Michauxiana* Hitchc., sown on *Apocynum cannabinum* L., and from *Spartina cynosuroides* (L.) Roth, sown on *Asclepias syriaca* L.

7. PUCCINIA SUBNITENS Diet.—Teliospores from *Distichlis spicata* (L.) Greene, sown on *Chenopodium album* L.

8. PUCCINIA WINDSORIAE Schw.—Teliospores from *Tridens flavus* (L.) Hitchc. (*Tricuspis sesleroides* Torr.), sown on *Ptelea trifoliata* L.

B. SPECIES REPORTED NOW FOR THE FIRST TIME

1. PUCCINIA TUMIDIPES Peck.—Teliospores from *Lycium pallidum* Miers, sown on *L. vulgare* Dunal, producing pycnia and uredinia.

2. PUCCINIA DISTICHLIDIS Ellis & Ev.—Teliospores from *Spartina Michauxiana* Hitchc., sown on *Steironema ciliatum* (L.) Raf.

3. PUCCINIA MONTANENSIS Ellis (*Aecidium Hydrophylli* Peck).—Aeciospores from *Hydrophyllum capitatum* Dougl., sown on *Agropyron tenerum* Vasey and *Elymus virginicus* L.

4. UROMYCES HORDEI Tracy.—Teliospores from *Hordeum pusillum* Nutt., sown on *Nothoscordium bivalve* (L.) Britton.

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FUNGI OF NEW MEXICO[1]

PAUL C. STANDLEY

The flowering plants and vascular cryptogams of New Mexico are now fairly well known and much has been published concerning them. The collections upon which our knowledge is based were begun as early as 1820, and some of the larger and more important ones were made from 1846 to the middle fifties, although most of our knowledge of the plants of the state results from the extensive collections obtained in the last twenty-five years.

Concerning the lower cryptogams of New Mexico, however, only the most fragmentary information is available. The early collectors paid little attention to any but the higher plants. August Fendler (1846–47) and Charles Wright (1851–52) gathered a few mosses and hepatics, but even the most recent collectors have taken little interest in those groups or in the lichens and fungi. Dr. T. H. Macbride spent one season in New Mexico collecting Myxomycetes and published[2] a list of 25 species which he obtained. Prof. T. D. A. Cockerell, ever an untiring student of matters pertaining to the natural history of the state, has collected many specimens of cryptogams, and has published[3] the only list of New Mexican fungi (46 species) which has thus far appeared. Several mycologists—S. M. Tracy, F. S. Earle, David Griffiths, G. G. Hedgcock, E. W. D. Holway, and perhaps others—have collected in New Mexico. In the spring of 1914 Dr. J. C. Arthur and Dr. F. D. Fromme visited the state for the purpose of securing material for their investigations of the Uredinales. But the only results from these explorations, so far as the literature of New Mexican mycology is concerned, have been scattered descriptions of new species or incidental references in various monographs.

[1] Published by permission of the Secretary of the Smithsonian Institution.

[2] Proc. Iowa Acad. Sci. **12**: 33–38. 1905.

[3] Jour. Myc. **10**: 49–51. 1904.

Although the present writer's chief interest has always been in the phanerogamic flora of New Mexico, soon after the beginning of his studies in the state (in 1909) he began to collect such of the lower cryptogams as he happened upon. It is to be regretted that more attention was not devoted to them and much larger collections obtained, as might easily have been done especially in the southern part of the state. During three different years, however, the writer has spent some time in searching especially for parasitic fungi: in 1908 in the Santa Fe and Las Vegas mountains; in 1911 in Rio Arriba and San Juan counties; and in 1914 in the vicinity of Brazos Canyon, Rio Arriba County. The present paper is based chiefly upon the collections thus obtained. There are also included references to many specimens obtained by Mr. E. O. Wooton. Prof. Cockerell has very kindly furnished a manuscript list of species of his collection not included in his published list, while Dr. Arthur has made available material which permits the inclusion of several species, as well as specimens showing more extended distribution. Reference is made also to such reliable data as have been found in literature, but no doubt some published records have been overlooked.

Not being a mycologist, the writer has been obliged to turn to others for the identifications of his collections and he takes pleasure in acknowledging the generous interest and pains taken by those who have named the material. Dr. J. C. Arthur has furnished the identifications of the Uredinales; Dr. G. P. Clinton those of the Ustilaginales; Dr. W. A. Murrill the Agaricales and Lycoperdales; and Dr. C. E. Fairman, Dr. David R. Sumstine, and Prof. Guy West Wilson those of the other groups. Special thanks are due Dr. Arthur upon whom fell the task of naming the larger part of the specimens. Dr. Arthur has also furnished supplementary material and data and has revised the manuscript of the Uredinales.

Although the chief part of the present list consists of the Uredinales and Ustilaginales, it seems worth while to publish the lists of other groups, although they are evidently only fragmentary. It is greatly to be desired that in the near future an adequate study

may be made of the Agaricales and Lycoperdales, of which the New Mexico mountains will doubtless furnish many species.

CHYTRIDALES

SYNCHYTRIUM FULGENS Schröt.

On *Anogra coronopifolia* (T. & G.) Britton: Dulce, Aug. 19, 1911, *Standley 8106.* Determined by Sumstine.

PERONOSPORALES

(Determined by Prof. Guy West Wilson, unless stated otherwise)

ALBUGO BLITI (Biv.) Kuntze

On *Amaranthus Powellii* S. Wats. (a new host): Plains 35 miles south of Torrance, Aug. 10, 1909, *Wooton* (determined by Sumstine); Pecos, Aug. 22, 1908, *Standley 5191;* Cedar Hill, Aug. 15, 1911, *Standley 7900.* On *Amaranthus blitoides* S. Wats.: Torrance, Aug. 11, 1909, *Wooton.*

ALBUGO CANDIDA (Pers.) Roussel

On *Sophia incisa* (Engelm.) Greene: Filmore Canyon, Sept. 20, 1908, *Standley;* Winsor Creek, July 13, 1908, *Standley 4340.* On *Cheirinia* sp.: Range Reserve, Dona Ana Co., May 14, 1913, *Wooton;* San Andreas Mts., October, 1914, *Wooton.*

ALBUGO FROELICHIAE G. W. Wilson

Reported from New Mexico, on *Cladothrix lanuginosa* Nutt. (*Tidestromia lanuginosa* (Nutt.) Standley[4]) by Wilson.[5]

ALBUGO IPOMOEAE-PANDURATAE (Schw.) Swingle

On *Ipomoea hirsutula* Jacq.: Round Mt., above Tularosa, July 22, 1897, *Wooton.*

[4] Jour. Wash. Acad. **6**: 70. 1916.
[5] Bull. Torrey Club **35**: 362. 1908.

ALBUGO TRIANTHEMAE G. W. Wilson

On *Trianthema Portulacastrum* L.: Mesilla Valley, August, 1908, *Standley*.

The type was collected near Las Cruces by Wooton. The species is known only from the Mesilla Valley.

PERONOSPORA LEPIDII (McAlp.) G. W. Wilson

On *Sophia incisa* (Engelm.) Greene (a new host): Placitas, Aug. 3, 1910, *Wooton*.

PERONOSPORA PARASITICA (Pers.) Fries

On *Sophia incisa* (Engelm.) Greene: Beatty's Cabin, Aug. 8, 1908, *Standley 4842*. On *Sophia ochroleuca* Wooton (a new host): Mesilla Valley, 1908, *Standley 3886*.

PHYSOTHECA HALSTEDII (Farl.) G. W. Wilson

On *Ximenesia exauriculata* (Rob. & Greenm.) Rydb.: Pecos, Aug. 21, 1908, *Standley 5154;* Raton, June 22, 1911, *Standley 6309*.

PHYTOPHTHORA INFESTANS (Mont.) De Bary?

On *Solanum tuberosum* L. (cultivated): White Mts., Aug. 15, 1908, *Wooton*. Determined by Sumstine.

SPHAERIALES

(Erysiphaceae determined by Prof. Guy West Wilson, the others by Dr. C. E. Fairman, unless stated otherwise)

ASTERINA MEXICANA Ellis & Ev.

On *Agave neomexicana* Woot. & Standl.: Queen, July 31, 1909, *Wooton*. "Perithecia surrounded at base by mycelial threads. Asci abruptly stipitate, 60 × 17–20 μ; or saccate or globose; about 25–30 μ in diam. Sporidia: upper cell smaller and globose; lower cell longer and oblong, 24–30 × 10–12 μ. This was orig-

inally collected in Mexico, and I do not know whether it has been found in the States previously to the discovery of this specimen or not." (Fairman.)

AUERSWALDIA PRINGLEI (Peck) Sacc.

On leaves of *Yucca macrocarpa* (Engelm.) Coville: Mesa west of Organ Mts., September, 1908, *Standley*. "Sporidia uniseriate, hyaline then yellowish brown, oblong-elliptical, rounded at ends, 27–33 × 12–14 μ." (Fairman.)

CLAVICEPS PURPUREA Fr.

On *Agropyron Smithii* Rydb.: Near Ensenada, Sept. 10, 1914, *Standley & Bollman 11232*. On *Elymus canadensis* L.: Pecos, Aug. 25, 1908, *Standley 5319*.

DIMEROSPORIUM COLLINSII (Schw.) Thüm.

On *Amelanchier oreophila* A. Nels.: Brazos Canyon, Aug. 21, 1914, *Standley & Bollman 10681*. On *Amelanchier polycarpa* Greene: Chama, July 9, 1911, *Standley 6618*.

ERYSIPHE CICHORACEARUM DC.

On *Lactuca integrata* (Gren. & Godr.) A. Nels.: Farmington, July 20, 1911, *Standley 7150*. (? Immature.) On *Heliopsis scabra* Dunal: Gilmore's Ranch, Aug. 15, 1897, *Wooton*. On *Madia glomerata* Hook.: Brazos Canyon, Aug. 31, 1914, *Standley & Bollman 10072*. On *Chrysothamnus linifolius* Greene (a new host): Shiprock, Aug. 12, 1911, *Standley 7890*. On *Chrysothamnus Vaseyi* (A. Gray) Greene (a new host): Stinking Lake, Aug. 21, 1911, *Standley 8252*. On *Aster vallicola* Greene (a new host): Santa Fe, July 23, 1908, *Standley 4516*. On *Erigeron subtrinervis* Rydb. (a new host): Brazos Canyon, Sept. 6, 1914, *Standley & Bollman 11168*. On *Iva xanthiifolia* Nutt.: Pecos, Aug. 20, 1908, *Standley 5141*. On *Artemisia dracunculoides* Pursh (a new host): Winsor's Ranch, Aug. 12, 1908, *Standley 4894*. On *Hydrophyllum Fendleri* (A. Gray) Heller (a new host): Winsor Creek, July 5, 1908, *Standley 4199;* Chama, July

9, 1911, *Standley 6629;* (? Conidia) Brazos Canyon, Sept. 8, 1914, *Standley & Bollman 11200.* On *Mertensia pratensis* Heller (a new host): Chama, July 9, 1911, *Standley 6724.* On *Mertensia* sp.: Brazos Canyon, Aug. 25, 1914, *Standley & Bollman 10797.* (?) On *Phacelia heterophylla* Pursh: Beatty's Cabin, Aug. 8, 1908, *Standley 4855.*

Reported by Cockerell from Pecos on *Verbena Macdougalii* Heller.

ERYSIPHE GALEOPSIDIS DC.

On *Stachys scopulorum* Greene (a new host): Pecos, Aug. 22, 1908, *Standley 5196.*

ERYSIPHE GRAMINIS DC.

On *Poa pratensis* L.: Pecos, Aug. 22, 1908, *Standley 5173.*

ERYSIPHE POLYGONI DC.

On *Polygonum buxiforme* Small (a new host): (? Conidia) Pecos, Aug. 19, 1908, *Standley 5106;* Agricultural College, June 28, 1911, *Standley 6388;* Placitas, Aug. 3, 1910, *Wooton;* Farmington, July 18, 1911, *Standley 7061.* On *Polygonum ramosissimum* Michx.: Pecos, Aug. 15, 1908, *Standley 5003.* On *Pisum sativum* L.: Pecos, Aug. 22, 1908, *Standley 5182.* On *Glycyrrhiza lepidota* Nutt.: Pecos, Aug. 20, 1908, *Standley 5142.* On *Lathyrus leucanthus* Rydb. (a new host): Brazos Canyon, Aug. 30, 1914, *Standley & Bollman 10927.*

ERYSIPHE sp.

On *Polemonium molle* Greene: Placitas, Aug. 3, 1910, *Wooton.* Regarding this collection Prof. Wilson furnished the following note. "While *E. Cichoracearum* would be expected as the most probable species on this host, the present collection does not belong to that species, but appears to be undescribed. As the ascospores are very immature it does not seem wise to describe the form as new without further material."

Besides the specimens of Erysiphaceae listed above, several packets examined by Prof. Wilson contained nothing but the

Oidium stage. These are listed here with Prof. Wilson's suggestions as to the possible perithecial form. Since the present knowledge of the Erysiphaceae is not sufficient to warrant specific determinations of the relationships of Oidia, and the perithecia might prove the suggestions incorrect, the present determinations are, of course, only tentative.

Erysiphe Polygoni?. On *Oenothera procera* Wooton & Standley: Ponchuelo Creek, July 28, 1908, *Standley 4585*. On *Pisum sativum* L.: White Mts., Aug. 15, 1908, *Wooton*.

Erysiphe Cichoracearum?. On *Grindelia aphanactis* Rydb.: Dulce, Aug. 19, 1911, *Standley 8081*. On *Verbena Macdougalii* Heller: Pecos, Aug. 22, 1908, *Standley 5194*.

Uncertain. On *Dugaldea Hoopesii* (A. Gray) Rydb.: Chama, July 10, 1911, *Standley 6759*. On *Humulus Lupulus neomexicanus* Nels. & Cockerell: Pecos, Aug. 25, 1908, *Standley 5307*. On *Ximenesia exauriculata* (Rob. & Greenm.) Rydb.: Mesilla Valley, Oct. 15, 1905, *Wooton*.

MICROSPHAERA SYMPHORICARPI E. C. Howe

On *Symphoricarpos rotundifolius* A. Gray: Gilmore's Ranch, Aug. 14, 1897, *Wooton*.

OHLERIELLA NEOMEXICANA Earle

The type was collected by Cockerell, Nov. 29, 1901, on "old whitened woody stems," at Albuquerque.

PHYLLACHORA DASYLIRII Peck

Reported by Cockerell from Soledad Canyon, Organ Mts., on *Dasylirion Wheeleri* S. Wats.

PHYLLACHORA GRAMINIS (Pers.) Fuckel

On *Muhlenbergia neomexicana* Vasey: San Andreas Mts., Oct. 6, 1912, *Wooton*.

PHYLLACHORA TRIFOLII (Pers.) Fuckel

On *Trifolium repens* L.: Pecos, Aug. 25, 1908, *Standley 5291*. On *Trifolium Fendleri* Greene: Pecos, Aug. 19, 1908, *Standley*

5102. On *Trifolium Rydbergii* Greene: Costilla Valley, Sept. 5, 1913, *Wooton.*

PHYSALOSPORA AURANTIA Ellis & Ev.

On *Helianthus fascicularis* Greene: Pecos, Aug. 25, 1908, *Standley.* Determined by Sumstine.

PLOWRIGHTIA MORBOSA (Schw.) Sacc.

This is abundant on *Padus melanocarpa* (A. Nels.) Shafer, wherever that species grows. I do not remember having seen it on any of the other species of *Padus* but probably it occurs on them also.

PLOWRIGHTIA NEOMEXICANA Earle

The type was collected by Cockerell, July, 1902, between San Ignacio and Las Vegas, on dead, withered stems of *"Ampelopsis quinquefolia* (?)" (*Parthenocissus vitacea* (Knerr) Hitchc.).

PODOSPHAERA OXYCANTHAE (DC.) De Bary

On *Padus melanocarpa* (A. Nels.) Shafer: Placitas, Aug. 3, 1910, *Wooton.*

UNCINULA NECATOR (Schwein.) Burr.

Reported from New Mexico by Salmon (Mem. Torrey Club 9: 100. 1900).

UNCINULA POLYCHAETA (Berk. & Curt.) Ellis & Ev.

On *Celtis reticulata* Torr.: Filmore Canyon, Organ Mts., Sept. 20, 1908, *Standley.* Dr. Fairman states that this is a new host for this beautiful parasite. It is very common upon the hackberry trees in the Organ Mountains.

VENTURIA DICKIEI (B. & Br.) Ces. & De N.

On *Linnaea americana* Forbes: Horsethief Canyon, Pecos National Forest, Aug. 11, 1908, *Standley 4884.* Ellis and Everhart report this only from New Hampshire and New York. *Linnaea* is known in New Mexico only from the collection cited.

PEZIZALES

PEZIZA REGALIS C. & E.

Mesilla, on an apple tree (*Cockerell*). Determination by Earle.

PSEUDOPEZIZA MEDICAGINIS (Lib.) Sacc.

On *Medicago sativa* L.: Pecos, August, 1908, *Standley 8056*. Determined by Sumstine. Reported also from Roswell by Cockerell.

UREDINALES

AECIDIUM ABRONIAE Ellis & Ev.

On leaves of *Allionia melanotricha* Standley: White Mts., 1897, *Wooton*.

AECIDIUM ALLENII Clinton

On *Lepargyrea canadensis* (L.) Greene: Beulah, July, 1902, *Cockerell*.

Aecidium Cockerellii Arthur, sp. nov.

O. Pycnia unknown.

I. Aecia hypophyllous, in circular groups 1.5 mm. across, cupulate, round when free, ellipsoid when crowded sufficiently, 0.1 to 0.3 mm. in diameter; peridium pale, margin erect, erose; peridial cells rhomboidal, slightly longer than broad, 19–21 by 24–27 μ, overlapping somewhat, outer wall 7–10 μ thick, smooth, inner wall 1.5–2.5 μ thick, closely and finely verrucose; aeciospores angularly ellipsoid, oblong, or globoid, 15–18 by 18–23 μ; wall pale yellow to colorless, 1.5 μ thick, occasionally thickened to 2 μ at angles, closely and very finely verrucose, appearing almost smooth when wet.

On Solanaceae: *Chamaesaracha Coronopus* (Dunal) A. Gray, near Las Vegas, New Mexico, 1899, *T. D. A. Cockerell*.

AECIDIUM COMPOSITARUM Auct.

On leaves of *Dugaldea Hoopesii* (A. Gray) Rydb.: Cloudcroft, July 19, 1899, *Wooton;* Rio Pueblo, Aug. 11, 1910, *Wooton;* Winsor Creek, July 28, 1908, *Standley 4581*.

AECIDIUM EUPHORBIAE Am. Auct.

On *Tithymalus Chamaesula* (Boiss.) Woot. & Standl.: Pine Cienaga, southwest of the Mogollon Mts., July 17, 1900, *Wooton*. On leaves of *Tithymalus luridus* (Engelm.) Woot. & Standl.: Tunitcha Mts., Aug. 8, 1911, *Standley 7639*.

AECIDIUM EUROTIAE Ellis & Ev.

On *Eurotia lanata* (Pursh) Moq.: Organ, Sept. 28, 1896, *Cockerell* (*Arthur* in litt.).

AECIDIUM PHYSALIDIS Burr.

On leaves and stems of *Physalis comata* Rydb.: Sierra Grande, June 19, 1911, *Standley 6201*.

ARGOMYCES (?) OXALIDIS (Lév.) Arthur

On leaves of *Ionoxalis violacea* (L.) Small: Placitas, Aug. 3, 1910, *Wooton*.

CALLIOSPORA PETALOSTEMONIS Arthur

The type, on *Petalostemum oligophyllum* (Torr.) Rydb., was collected at Pecos in 1903 by Cockerell.

COLEOSPORIUM RIBICOLA (C. & E.) Arthur

On leaves of *Grossularia leptantha* (A. Gray) Cov. & Britt.: Placitas, Aug. 3, 1910, *Wooton;* Brazos Canyon, Aug. 27, 1914, *Standley & Bollman 10864*. On leaves of *Ribes Wolfii* Rothr.: Brazos Canyon, Aug. 26, 1914, *Standley & Bollman 10833*.

CRONARTIUM COLEOSPORIOIDES (Diet. & Holw.) Arthur

On leaves of *Castilleja linariaefolia* Benth.: Dulce, Aug. 19, 1911, *Standley 8109;* Tunitcha Mts., Aug. 8, 1911, *Standley 7823*. On *Castilleja integra* A. Gray: Tunitcha Mts., Aug. 8, 1911, *Standley 7825*. On leaves of *Castilleja confusa* Greene: Brazos Canyon, Aug. 31, 1914, *Standley & Bollman 10984*. On leaves and stems of *Castilleja sulphurescens* Rydb.: Brazos Canyon, Sept. 1, 1914, *Standley & Bollman 11027*.

CRONARTIUM COMANDRAE Peck

On leaves and stems of *Comandra pallida* A. DC.: Tunitcha Mts., Aug. 8, 1911, *Standley 7764;* Brazos Canyon, Sept. 10, 1914, *Standley & Bollman 11239.*

EARLEA SPECIOSA (Fries) Arthur

(*Phragmidium speciosum* Fries)

On *Rosa pecosensis* in New Mexico, according to Arthur (N. Am. Fl. **7**: 176. 1912). Another New Mexican plant on which this occurs in Colorado is *Rosa Fendleri.*

ERIOSPORANGIUM PUNCTATO-STRIATUM (Diet. & Neger) Arthur

On *Baccharis glutinosa* Pers.: Mesilla, June 1897, *Cockerell.*

GYMNOSPORANGIUM GRACILENS (Peck) Kern & Beth.

I. On leaves of *Fendlera rupicola* Engelm. & Gray: Organ Mts., Sept. 28, 1902, *Wooton.* On leaves and fruit of *Fendlera falcata* Thornber: Tunitcha Mts., August, 1911, *Standley.* On *Philadelphus microphyllus* A. Gray: Rito de los Frijoles, August, 1912, *Cockerell.* On *Philadelphus ellipticus* Rydb. (=*P. argyrocalyx* Wooton) in New Mexico, according to Kern (N. Am. Fl. **7**: 201. 1912).

III. On *Juniperus monosperma* (Engelm.) Sarg.: Near Placitas, June 29, 1908, *Hedgcock.* On *Juniperus pachyphloea* Torr. in New Mexico, according to Kern (l. c.).

GYMNOSPORANGIUM INCONSPICUUM Kern

I. On *Amelanchier Bakeri* Greene: Bear Mountain, Sept. 1, 1903, *Metcalf.*

The telial stage is reported from Colorado upon *Juniperus utahensis,* a species common in northwestern New Mexico.

GYMNOSPORANGIUM JUVENESCENS Kern

I. On leaves of *Amelanchier mormonica* Schneid.: Dulce, Aug. 20, 1911, *Standley 8205.*

The telial stage occurs in Colorado on *Juniperus scopulorum* Sarg., a common New Mexican species.

GYMNOSPORANGIUM NELSONI Arthur

I. On leaves of *Amelanchier oreophila* A. Nels.: Brazos Canyon, Aug. 21, 1914, *Standley & Bollman 10663.*

III. On *Juniperus scopulorum* Sarg.: Brazos Canyon, Aug. 27, 1914, *Standley & Bollman 10899.* Reported from Colorado also upon *J. utahensis* and *J. monosperma,* common new Mexican species.

HYALOPSORA CHEILANTHIS (Peck) Arthur

On *Notholaena sinuata* Kaulf.: Dark Canyon, Guadalupe Mts., Aug. 5, 1909, *Wooton.* This species is known upon four other ferns, *Ceropteris triangularis, Cheilanthes Pringlei, Cryptogamme Stelleri,* and *Pellaea andromedaefolia,* none of which occurs in New Mexico. Apparently it has not been reported before upon a *Notholaena.*

MELAMPSORA ALBERTENSIS Arthur

On leaves of *Populus aurea* Tidestrom: Brazos Canyon, Aug. 20, 1914, *Standley & Bollman 10627.* Reported by Arthur in the *North American Flora* only from Alberta.

MELAMPSORA ARCTICA Rostr.

On leaves of *Salix Bebbiana* Sarg.: Brazos Canyon, Aug. 20, 1914, *Standley & Bollman 10630, 10631;* a new host. On *Salix Wrightii* Anderss.: Mesquite, Aug. 15, 1914, *W. A. Archer.*

MELAMPSORA BIGELOVII Thüm.

On leaves of *Salix amygdaloides* Anderss.: Shiprock, Aug. 11, 1911, *Standley 7866.* On leaves of *Salix Wrightii* Anderss.: Mesilla Valley, Nov. 15, 1903, *Wooton;* a new host. On leaves of *Salix Bebbiana* Sarg.: Pecos, August, 1908, *Standley;* Ponchuelo Creek, July 30, 1908, *Standley 4590.* On leaves of *Salix* spp.: Tunitcha Mts., Aug. 8, 1911, *Standley 7713;* Farmington, July 22, 1911, *Standley 7161.* Reported by Arthur from other

states upon *Salix exigua, S. Fendleriana, S. irrorata, S. lasiandra, S. nigra, S. petrophila,* and *S. Watsoni,* all of which occur in New Mexico.

MELAMPSORA LINI (Schum.) Desmaz.

On leaves of *Linum Lewisii* Pursh: Chama, July 13, 1911, *Standley 6830.*

MELAMPSORA MEDUSAE Thüm.

On *Populus Wislizeni* (S. Wats.) Sarg.: Agricultural College, Sept. 22, 1914, *W. A. Archer.*

MELAMPSORELLA ELATINA (Alb. & Schw.) Arthur

Reported by Hedgcock as occurring in New Mexico (Mycologia 4: 145. 1912).

MELAMPSOROPSIS PYROLAE (DC.) Arthur

On leaves of *Pyrola asarifolia* Michx.: Winsor Creek, June 29, 1908, *Standley 4028.* On leaves of *Pyrola secunda* L.: Winsor Creek, June 29, 1908, *Standley 4029;* Brazos Canyon, Aug. 31, 1914, *Standley & Bollman 10976.* Reported upon *Moneses uniflora, Pyrola chlorantha;* and *P. elliptica,* all of which are found in New Mexico.

NYSSOPSORA ECHINATA (Lév.) Arthur

On *Ligusticum Porteri* Coult. & Rose: Sandia Mts., August, 1903, *Hedgcock 107.*

PERIDERMIUM COLORADENSE (Diet.) Arthur & Kern

On leaves of *Picea Parryana* (Andr.) A. Gray: Winsor Creek, July 28, 1908, *Standley 4751;* Rio Pueblo, Aug. 10, 1910, *Wooton.*

PERIDERMIUM EPHEDRAE Cooke[6]

On stems of *Ephedra trifurca* Torr.: Mesa west of Organ Mts., Sept. 28, 1902, *Wooton 3716;* mesa near Las Cruces, July 5, 1897,

[6] See Paul C. Standley, A witch's broom of the desert, Plant World 13: 61–63. 1909.

Wooton 542. On stems of *Ephedra Torreyana* S. Wats.: Buchanan, Aug. 12, 1909, *Wooton.* This rust is extremely common upon *Ephedra trifurca* in southern New Mexico. Because of its large size and bright orange color it is very conspicuous. Dr. Arthur states that no clue to the telial host has yet been obtained.

PHRAGMIDIUM IMITANS Arthur

On leaves of *Rubus arizonicus* (Greene) Rydb.: Cloudcroft, Aug. 8, 1899, *Wooton;* Brazos Canyon, Aug. 31, 1914, *Standley & Bollman 10999.*

PHRAGMIDIUM MONTIVAGUM Arthur

On leaves of *Rosa Fendleri* Crép.: Pecos National Forest, 1908, *Standley.* On leaves of *Rosa* sp.: Brazos Canyon, Aug. 20, 1914, *Standley & Bollman 10638.* To be expected in New Mexico on *Rosa Maximiliani,* upon which it has been found in Colorado.

PHRAGMIDIUM OCCIDENTALE Arthur

On leaves of *Rubacer parviflorum* (Nutt.) Rydb.: Winsor's Ranch, July 4, 1908, *Standley 4178;* Carrizo Mts., August, 1911, *Standley 7738a.*

PHRAGMIDIUM PECKIANUM Arthur

On leaves of *Oreobatus deliciosus* (James) Rydb.: Sierra Grande, June 19, 1911, *Standley 6203.* This is the only New Mexican locality known for this *Oreobatus. Phragmidium Peckianum* is reported by Arthur from New Mexico also upon *Oreobatus neomexicanus* (A. Gray) Rydb. (N. Am. Fl. 7: 165. 1912).

PHRAGMIDIUM POTENTILLAE (Pers.) Karst.

On leaves of *Potentilla strigosa* Pall.: Ensenada, Sept. 10, 1914, *Standley & Bollman 11227.* The species is reported (from Maine) upon *Potentilla monspeliensis,* a species common in New Mexico.

PILEOLARIA PATZCUARENSIS (Holway) Arthur

On *Schmaltzia Emoryi* Greene in New Mexico according to Arthur (N. Am. Fl. **7**: 149. 1912). The only other locality known for the species is in Michoacán, Mexico, where it occurs upon *S. schmidelioides* (Schlecht.) Greene.

POLYTHELIS THALICTRI (Chev.) Arthur

On leaves of *Thalictrum Fendleri* Engelm.: Tunitcha Mts., Aug. 8, 1911, *Standley 7744;* Chama, July 13, 1911, *Standley 6826.*

PUCCINIA ABSINTHII DC.

On *Artemisia redolens* A. Gray: Cloudcroft, Sept. 17, 1903, *E. W. D. Holway (Bartholomew 767).* On leaves and stems of *Artemisia silvicola* Osterh.: Brazos Canyon, Aug. 27, 1914, *Standley & Bollman 10844.*

PUCCINIA ARISTIDAE Tracy

On leaves of *Aristida bromoides* H. B. K.: San Andreas Mts., Oct. 8, 1914, *Wooton.*

PUCCINIA ARTEMISIAE DC.

On leaves and stems of *Artemisia tridentata* Nutt.: Dulce, Aug. 19, 1911, *Standley 8065;* Cedar Hill, Aug. 15, 1911, *Standley 7903.* On leaves of *Artemisia nova* A. Nels.: Dulce, Aug. 19, 1911, *Standley 8100.* On leaves of *Artemisia cana* Pursh: Dulce, Aug. 19, 1911, *Standley 8083.*

PUCCINIA ASPARAGI DC.

III. On *Asparagus officinalis* L.: Mesilla, Dec. 28, 1915, *W. A. Archer 20.*

PUCCINIA ATRO-FUSCA (Dudley) Holway

On leaves of *Carex Douglasii* Boott: Winsor's Ranch, June 20, 1908, *Standley 4095.*

PUCCINIA CANALICULATA (Schw.) Lagerh.

On leaves of *Cyperus esculentus* L.: Mesilla Valley, Oct. 11, 1904, *Wooton.*

PUCCINIA CIRSII Lasch

On leaves of *Cirsium pallidum* Woot. & Standl.: Brazos Canyon, Sept. 2, 1914, *Standley & Bollman 11057.* On *Cirsium undulatum* (Nutt.) Spreng.: Sandia Mts., June 2, 1914, *Miss C. C. Ellis.* On leaves of *Cirsium Wrightii* A. Gray (?): Cloudcroft, Sept. 16, 1903, *E. W. D. Holway* (*Bartholomew, N. Am. Ured. 131*) (II, III).

PUCCINIA CLEMATIDIS (DC.) Lagerh.

[*Puccinia Delphinii* Diet. & Holw.; *Puccinia Agropyri* Ellis & Ev.; *Puccinia alternans* Arthur; *Puccinia obliterata* Arthur.]

I. On leaves, stems, and sepals of *Clematis ligusticifolia* Nutt.: Fresnal, Aug. 6, 1899, *Wooton;* Pecos, Aug. 25, 1908, *Standley;* Placitas, Aug. 3, 1910, *Wooton;* Tunitcha Mts., Aug. 8, 1911, *Standley 7770;* Farmington, July 17, 1911, *Standley 6893.* On leaves of *Thalictrum Fendleri* Engelm.: Winsor's Ranch, June 29, 1908, *Standley 4007;* Chama, July 13, 1911, *Standley 6829;* Beulah, July 10, 1902, *Cockerell.* On *Halerpestes Cymbalaria* (Pursh) Greene: Las Vegas, June 7, 1902, *Cockerell 45.* On *Aquilegia caerulea* James: Beulah, June 29, 1909, *W. P. Cockerell.*

On leaves of *Elymus canadensis* L.: Agricultural College, June 28, 1911, *Standley 6383.* On *Delphinium Sapellonis* Cockerell: Sapello Canyon, *Cockerell.*

PUCCINIA CRESSAE (DC.) Lagerh.

On leaves of *Cressa truxillensis* H. B. K.: Mesilla Valley, Sept. 25, 1907, *Standley;* June, 1896, *Wooton.*

PUCCINIA CRYPTANDRI Ellis & Barth.

On *Sporobolus cryptandrus* (Torr.) A. Gray: Mesilla, Oct. 7, 1915, *W. A. Archer 6;* Las Vegas Hot Springs (*Cockerell*).

PUCCINIA ELLISIANA Thüm.

I. On leaves of *Viola pedatifida* Don: Sierra Grande, June 20, 1911, *Standley 6226.*

PUCCINIA EPILOBII-TETRAGONI (DC.) Wint.

On stems of *Epilobium adenocladon* (Hausskn.) Rydb.: Brazos Canyon, Sept. 2, 1914, *Standley & Bollman 11055.*

PUCCINIA EXTENSICOLA Plowr.

[*P. Caricis-Asteris* Arthur; *P. Caricis-Solidaginis* Arthur.]

I. On leaves of *Solidago Pitcheri* Nutt.: Winter Folly, Aug. 13, 1899, *Wooton.* On leaves of *Aster laevis* L.: Winsor's Ranch, July 4, 1908, *Standley 4180;* Chama, July 14, 1911, *Standley 6838.*

PUCCINIA GAYOPHYTI (Billings) Peck

On stems of *Gayophytum ramosissimum* Torr. & Gray: Dulce, Aug. 19, 1911, *Standley 8073.*

PUCCINIA GRINDELIAE Peck

On stems and involucral bracts of *Gutierrezia tenuis* Greene: Mesa west of Organ Mts., September, 1908, *Wooton & Standley 3863.* On stems and leaves of *Gutierrezia* sp.: Cactus Flat, July 5, 1906, *Wooton.* On *Grindelia* sp.: Santa Fe, 1898, Cockerell. On leaves of *Grindelia aphanactis* Rydb.: Nara Visa, Oct. 2, 1907, *W. Belknap;* Santa Fe, Oct. 1, 1907, *A. Boyle.* On leaves of *Grindelia subalpina* Greene: Raton, June 22, 1911, *Standley 6327.*

PUCCINIA GROSSULARIAE (Pers.) Lagerh.

I. On leaves of *Grossularia leptantha* (A. Gray) Cov. & Britt.: Chama, July 9, 1911, *Standley 6644;* Winsor's Ranch, July 3, 1908, *Standley 4168.*

PUCCINIA HELIANTHI Schw.

On leaves of *Helianthus annuus* L.: Mesilla Valley, August, and Sept. 4, 1908, *Standley;* Agricultural College, June 28, 1911,

Standley 6392; Tunitcha Mts., Aug. 8, 1911, *Standley 7790;* Farmington, July 22, 1911, *Standley 7175.* On *Helianthus ciliaris* DC.: Mesilla, *Cockerell;* Mesilla Park, May 9, 1915, *W. A. Archer* (I); Las Cruces, Oct. 27, 1892, *Wooton;* Albuquerque, December, 1914, *W. A. Long 5183;* Brazito, June 15, 1915, *Archer* (I, II, III).

PUCCINIA HEMISPHERICA Peck

On leaves and stems of *Lactuca pulchella* (Pursh) DC.: Raton, June 21, 1911, *Standley 6301* (O, I); Cedar Hill, Aug. 17, 1911, *Standley 8057* (III).

PUCCINIA INTERMIXTA Peck

I. On leaves of *Iva axillaris* Pursh: Las Vegas, June 2, 1900, *T. A. Williams.*

PUCCINIA JAMESIANA (Peck) Arthur

On *Asclepias galioides* H. B. K.: Gray, July, 1900, *Skehan.* On leaves of *Asclepias brachystephana* Engelm. (I): Redlands, Aug. 17, 1909, *Wooton.* On leaves of *Asclepias latifolia* (Torr.) Raf. (I): Redlands, Aug. 17, 1909, *Wooton.* On *Bouteloua curtipendula* (Michx.) Torr.: Filmore Canyon, Organ Mts., Sept. 20, 1908, *Standley.* Reported (as *Aecidium Brandegei* Peck) from Las Vegas, on "*Asclepias subverticillata* (A. Gray) Vail" (apparently *A. galioides* H. B. K.) by Johnson (Proc. Ind. Acad. Sci. **1911**: 399. 1912).

PUCCINIA KOELERIAE Arthur

I. (*Aecidium Fendleri* Tracy & Earle). On leaves of *Berberis Fendleri* A. Gray: Winsor's Ranch, June 30, 1908, *Standley 4078.*

PUCCINIA LOBATA Berk. & Curt.

On *Disella lepidota* (A. Gray) Greene: San Andreas Mts., Sept. 23, 1912, *Wooton.* On leaves of *Disella hederacea* (Dougl.) Greene: Mesilla Valley, Oct. 15, 1901, Oct. 29, 1903, *Wooton.* On leaves of cultivated hollyhocks (*Althaea rosea* L.): Mesilla

Valley, Sept. 15, 1899, Oct. 1, 1904, *Wooton;* Pecos, Aug. 26, 1908, *Standley 5324.*

PUCCINIA LUXURIANS Syd.

On *Sporobolus airoides* Torr.: Brazito, Sept. 1, 1915, *W. A. Archer 13.*

PUCCINIA MENTHAE Pers.

On leaves of *Mentha Penardi* (Briq.) Rydb.: Brazos Canyon, Sept. 3, 1914, *Standley & Bollman 11119.* On leaves of *Monarda stricta* Wooton: Brazos Canyon, Aug. 27, 1914, *Standley & Bollman 10884.* Reported by Cockerell from Pecos on the latter host.

PUCCINIA MONOICA (Peck) Arthur

I. On *Arabis Fendleri* (S. Wats.) Greene: Santa Fe, May, 1897, *Heller.* On leaves of *Arabis oxyphylla* Greene: Grass Mt., July 16, 1908, *Standley 4368.* On *"Draba aurea"*: Coolidge, June 20, 1887, *Tracy & Evans.* Reported by Cockerell from Las Vegas, on *Sophia incisa* (Engelm.) Greene.

PUCCINIA MONTANENSIS Ellis

[*Aecidium Hydrophylli* Peck; *Aecidium Phaceliae* Peck.]

On some unidentified grass: Albuquerque, Nov. 1, 1914, *W. H. Long.* On leaves of *Hydrophyllum Fendleri* (A. Gray) Heller (I): Winsor's Ranch, July 1, 1908, *Standley 4128;* Beulah, *Cockerell.* On leaves of *Phacelia heterophylla* Pursh (I): Winsor Creek, Aug. 4, 1908, *Standley 4749;* Chama, July 9, 1911, *Standley 6619;* Beulah, *Cockerell.* On *Koeleria cristata* (L.) Pers.: Organ Mts., Feb. 22, 1914, *Arthur & Fromme 5605.*

PUCCINIA MUHLENBERGIAE Arth. & Holw.

(*Aecidium Sphaeralceae* Ellis & Ev.; *Puccinia tosta* Arthur.)

On leaves of *Muhlenbergia repens* (Presl) Hitchc. (*Sporobolus utilis* (Torr.) Scribn.): Mesilla Valley, Oct. 15, 1903, *Wooton 3731.* On leaves of *Sporobolus asperifolius* (Nees & Mey.) Thurb.: Mesilla Park, Feb. 19, 1914, *Arthur & Fromme 5504,*

5055; Agricultural College, June 28, 1911, *Standley 6382;* Albuquerque, December, 1914, *W. H. Long 5181.* On leaves of *Sphaeralcea lobata* Wooton: Agricultural College, June 28, 1911, *Standley 6393;* Mesilla, June 19, 1897, *Wooton;* Pecos, Aug. 22, 1908, *Standley 5185.* On *Disella hederacea* (Dougl.) Greene (*Sida hederacea* (Dougl.) Torr.): Hatch, June 22, 1914, *W. A. Archer;* Mesilla Park, July 13, 1914, *W. A. Archer.* On *Muhlenbergia squarrosa* (Trin.) Rydb.: Las Vegas, Oct. 5, 1901, *Cockerell.*

The type of *Aecidium Sphaeralceae* was collected at Las Cruces on "*Sphaeralcea angustifolia* Don" (*S. lobata* Wooton).

PUCCINIA OBTECTA Peck

On *Scirpus americanus* Pers.: Mesilla, Oct. 5, 1915, *W. A. Archer 11.*

PUCCINIA PHILIBERTIAE Ellis & Ev.

The type was collected "on leaves and follicles of *Philibertia viriflora?* Britton and Rusby," near Las Cruces, *Wooton 43.*

PUCCINIA POCULIFORMIS (Jacq.) Wettst.

[*P. graminis* Pers.]

On leaves of *Triticum vulgare* L.: Pecos, Aug. 22, 1908, *Standley 5178.* On leaves of *Avena fatua* L.: Pecos, Aug. 22, 1908, *Standley 5180.* On leaves of *Hordeum jubatum* L.: Pecos, Aug. 25, 1908, *Standley 5312.* On leaves of *Agropyron Smithii* Rydb.: Dulce, Aug. 19, 1911, *Standley 8079.*

PUCCINIA PSEUDOCYMOPTERI Holway

On leaves and stems of *Pseudocymopterus montanus* (A. Gray) Coult. & Rose: Chama, July 10, 1911, *Standley 6774;* Dulce, Aug. 20, 1911, *Standley 8169;* Brazos Canyon, Sept. 1, 1914, *Standley & Bollman 11011.*

PUCCINIA PUNCTATA Link

On *Galium asperrimum* A. Gray: Cloudcroft, Sept. 16, 1903, *E. W. D. Holway* (*Syd. Ured. 2037*) (Arthur in litt.).

PUCCINIA SHERARDIANA Körn.

On leaves of *Malvastrum elatum* (Baker) A. Nels.: Pecos, Aug. 15, 1908, *Standley 4963*.

PUCCINIA SORGHI Schw.

On leaves of cultivated maize (a Mexican variety): Pecos, Aug. 25, 1908, *Standley 5286*.

PUCCINIA SPHAERALCEAE Ellis & Ev.

On *Sphaeralcea arenaria* Woot. & Standl.: San Andreas Mts., Oct. 10, 1914, *Wooton*. On *Sphaeralcea incana* Torr.: Organ Mts., Feb. 22, 1914, *Arthur & Fromme 5608, 5609*. On leaves and stems of *Sphaeralcea marginata* York: Farmington, July 18, 1911, *Standley 7018*. On leaves of *Sphaeralcea lobata* Wooton: Pecos, Aug. 22, 1908, *Standley 5184*. On leaves and stems of *Sphaeralcea Fendleri* A. Gray: Cedar Hill, Aug. 17, 1911, *Standley 8046;* Dulce, Aug. 20, 1911, *Standley 8164*. On *Disella hederacea* (Dougl.) Greene (*Sida hederacea* (Dougl.) Torr.): Agricultural College, October, 1915, *W. A. Archer 22*.

PUCCINIA SPLENDENS Vize.

On leaves and stems of *Hymenoclea monogyra* Torr. & Gray: Mesa west of Organ Mts., Oct. 6, 1904, *Wooton 3793*. The fungus is very abundant upon this shrub in southern New Mexico, forming great knots upon the branches suggestive of the black knot of plums and cherries.

PUCCINIA STIPAE Arthur

I. On leaves of *Solidago Pitcheri* Nutt.: Gilmore's Ranch, Aug. 17, 1908, *Wooton*.

PUCCINIA SUBNITENS Dietel

On *Salsola pestifer* A. Nels.: Mesilla Park, April 25, 1915, *W. A. Archer*. On leaves of *Sophia incisa* (Engelm.) Greene (I): James Canyon, June 26, 1899, *Wooton*. On *Chenopodium album* L.: Mesilla Park, April 25, 1915, *W. A. Archer* (I). On

Chenopodium pratericola Rydb. (I): Mesilla Park, April 25, 1915, *Archer*. On young plant of *Chenopodium Fremonti* S. Wats. (I): Mesilla Park, April 26, 1915, *Archer*. On leaves of *Distichlis spicata* (L.) Greene: Mesilla Park, Feb. 19, 1914, *Arthur & Fromme 5502;* Albuquerque, Nov. 9, 1914, *W. H. Long 3672;* Mesquite Lake, June 14, 1908, *Standley 3932;* San Antonio, Oct. 15, 1907, *J. D. Tinsley;* Farmington, July 17, 1911, *Standley 6898*. Reported (as *Aecidium Lepidii* Tr. & Gall.) by Cockerell (Jour. Myc. **10**: 51. 1904) from Hagerman, on *Lepidium alyssoides* A. Gray.

PUCCINIA TARAXACI Plow.

On leaves of *Taraxacum Taraxacum* (L.) Karst.: Chama, July 9, 1911, *Standley 6697*.

PUCCINIA TUBERCULANS Ellis & Ev.

On leaves of *Isocoma heterophylla* (A. Gray) Greene: Mesilla Valley, Oct. 4, 1899, *Wooton*.

PUCCINIA TUMIDIPES Peck

On leaves of *Lycium pallidum* Miers: Farmington, July 19, 1911, *Standley 7071;* Carrizo Mts., July 30, 1911, *Standley 7449*.

PUCCINIA UNIVERSALIS Arthur

I. On leaves of *Artemisia franserioides* Greene: Beatty's Cabin, Aug. 8, 1908, *Standley 4840*.

PUCCINIA VERATRI Clinton

On leaves of *Veratum speciosum* Rydb.: Brazos Canyon, Aug. 31, 1914, *Standley & Bollman 10946*. Reported by Cockerell from Beulah.

PUCCINIA VIOLAE (Schum.) DC.

On leaves of *Viola canadensis* L.: Cloudcroft, Aug. 8, 1899, *Wooton*. On leaves of *Viola nephrophylla* Greene: Brazos Canyon, Aug. 21, 1914, *Standley & Bollman 10651*.

PUCCINIA XANTHII Schw.

On leaves of *Xanthium commune* Britton: Mesilla Valley, Oct. 13, 1898, *Wooton;* Farmington, July 19, 1911, *Standley 7076;* Carrizo Mts., Aug. 1, 1911, *Standley 7492.* Reported by Cockerell from Roswell.

PUCCINIASTRUM AGRIMONIAE (Schw.) Tranz.

On *Agrimonia striata* Michx.: [Las Vegas?] Hot Springs, Sept. 15, 1896, *Holway.*

PUCCINIASTRUM MYRTILLI (Schum.) Arthur

On leaves of *Vaccinium oreophilum* Rydb.: Brazos Canyon, Sept. 8, 1914, *Standley & Bollman 11199.*

PUCCINIASTRUM PUSTULATUM (Pers.) Dietel

On *Chamaenerion angustifolium* (L.) Scop.: Brazos Canyon, Aug. 20, 1914, *Standley & Bollman 10635.* On leaves and stems of *Epilobium novomexicanum* Hausskn.: Farmington, July 18, 1911, *Standley 7045;* Brazos Canyon, Aug. 31, 1914, *Standley & Bollman 10947.*

RAVENELIA MESILLIANA Ellis & Barth.

The type was collected at Mesilla, New Mexico, on *Cassia bauhinioides* A. Gray. The species is known only from this locality.

RAVENELIA VERSATILIS (Peck) Dietel

On *Acacia Greggii* A. Gray: Rio Gila, Aug. 15, 1902, *Wooton 3743.* The species is confined, so far as known, to this host and occurs also in Texas, Arizona, and California.

TRANZSCHELIA PUNCTATA (Pers.) Arthur

[*Puccinia Pruni-spinosae* Pers.]

On cultivated apricots: Mesilla Valley, June, 1908, *Wooton.*

UREDINOPSIS PTERIDIS Diet. & Holw.

On *Pteridium aquilinum pubescens* Underw.: Brazos Canyon, Aug. 21, 1914, *Standley & Bollman 10692*. Arthur, in the North American Flora, reports the species from California, Washington, and Florida.

UROMYCES ALBUS Diet. & Holw.

I. On leaves of *Vicia americana* Muhl.: Sierra Grande, June 20, 1911, *Standley 6219;* Winsor's Ranch, July 8, 1908, *Standley 4256;* Chama, July 13, 1911, *Standley 6825*.

UROMYCES APPENDICULATUS (Pers.) Fries

On leaves and fruit of *Phaseolus vulgaris* L. (cultivated): Mesilla Valley, Oct. 10, 1905, *Wooton*. Reported by Arthur (N. Am. Fl. 7: 258. 1912) from New Mexico on *Strophostyles* sp.

UROMYCES ARCHERIANUS Arthur & Fromme

III. On *Chloris elegans* H. B. K.: Mesilla Park, March 22, 1915, *W. A. Archer*.

UROMYCES ASTRAGALI Sacc.

On *Astragalus Wootoni* Sheld.: Mesquite Lake, June 14, 1908, *Standley 3931;* Range Reserve, Dona Ana Co., May 14, 1913, *Wooton*. On *Astragalus* sp.: Las Vegas, June 2, 1900, *T. A. Williams*. Reported by Arthur from Colorado or Arizona on the following hosts, all of which are found in New Mexico: *Oxytropis Lamberti, Astragalus amphioxys, A. Bigelovii, A. crassicarpus, A. mollissimus,* and *A. Thurberi*.

UROMYCES COMPACTUS Peck

On *Leucosyris spinosus* (Benth.) Greene: Brazito, Sept. 1, 1915, *W. A. Archer 3* (I); Brazito, October, 1915, *Archer 24* (III).

UROMYCES ERIOGONI Ellis & Hark.

On leaves of *Eriogonum racemosum* Nutt.: Tunitcha Mts., Aug. 8, 1911, *Standley 7757;* Dulce, Aug. 20, 1911, *Standley 8221;* Chama, July 11, 1911, *Standley 6814.* Reported by Arthur from other states on the following species which occur in New Mexico: *Eriogonum cernuum, E. effusum,* and *E. lonchophyllum.*

UROMYCES FABAE (Pers.) De Bary

On leaves of *Lathyrus leucanthus* Rydb.: Dulce, Aug. 20, 1911, *Standley 8170;* Brazos Canyon, Aug. 20, 1914, *Standley & Bollman 10636.* On leaves and stems of *Vicia americana* Muhl.: Dulce, Aug. 20, 1911, *Standley 8182;* Brazos Canyon, August, 1914, *Standley & Bollman 10667, 10986.* The species may be looked for in New Mexico on the following hosts upon which it occurs elsewhere: *Lathyrus arizonicus* and *L. decaphyllus.*

UROMYCES GENTIANAE Arthur

On all chlorophyll-bearing parts of *Amarella heterosepala* (Engelm.) Greene: Brazos Canyon, Sept. 3, 1914, *Standley & Bollman 11089.* The species is reported from Colorado on *Amarella strictiflora* and may be expected in New Mexico on the same host.

UROMYCES GLYCYRRHIZAE (Rab.) Magn.

On leaves and stems of *Glycyrrhiza lepidota* Nutt.: Mesilla Valley, *Wooton;* Agricultural College, June 28, 1911, *Standley 6398;* Pecos, Aug. 15, 1908, *Standley 4964;* Cedar Hill, Aug. 16, 1911, *Standley 8009;* Taos, Aug. 9, 1910, *Wooton.*

UROMYCES HYALINUS Peck

On leaves and stems of *Sophora sericea* Nutt.: Mesilla Valley, June 12, 1900, *Wooton 3725;* Mesilla Park, May 31, 1914, *W. A. Archer.* Reported from Las Vegas by Cockerell.

UROMYCES LIMONII (DC.) Lév.

I. On *Limonium limbatum* Small: Roswell, June, 1899, *J. D. Tinsley;* south of Tularosa (*Cockerell*). In the North American Flora this is not reported from the region between California and Mississippi.

UROMYCES MEDICAGINIS Pass.

On leaves of *Medicago sativa* L.: Chamberino, Oct. 16, 1907, *J. H. Bruce.* The species should be found in New Mexico on *Medicago lupulina,* since it occurs elsewhere on that host.

UROMYCES MYSTICUS Arthur

On leaves of *Hordeum jubatum* L.: Farmington, July 22, 1911, *Standley 7172* (II); Shiprock, Aug. 12, 1911, *Standley 7884.* Reported in the North American Flora only from Colorado and Utah.

UROMYCES OCCIDENTALIS Dietel

On leaves of *Lupinus ammophilus* Greene: Dulce, Aug. 20, 1911, *Standley 8234;* a new host. On leaves of *Lupinus Kingii* S. Wats.: G O S Ranch, 1911, *J. M. Holzinger.*

UROMYCES PLUMBARIUS Peck

On all chlorophyll-bearing parts of *Gaura induta* Woot. & Standl.: Pecos, Aug. 22, 1908, *Standley 5176;* Dulce, Aug. 19, 1911, *Standley 8102;* Farmington, July 22, 1911, *Standley 7173.* This species is reported from Colorado upon *Gaura glabra* Lehm., but the host is probably rather *Gaura induta. Uromyces plumbarius* occurs in other states upon *Gaura coccinea, G. parviflora, G. villosa, Pachylophus hirsutus,* and *P. macroglottis,* and should be sought in New Mexico upon the same hosts. It may be expected to occur also upon some of our Oenotheras, for it is found elsewhere on *O. biennis.*

UROMYCES PROEMINENS (DC.) Pass.

On leaves of *Chamaesyce serpyllifolia* (Pers.) Small: Farmington, July 22, 1911, *Standley 7160;* Cedar Hill, Aug. 16, 1911,

Standley 8014 (III). Silver City Draw, July 1, 1906, *Wooton 3720.* On leaves of *Chamaesyce glyptosperma* (Engelm.) Small: Dulce, Aug. 20, 1911, *Standley 8163.* On *Chamaesyce stictospora* (Engelm.) Small: San Andreas Mts., Oct. 6, 1912, *Wooton;* a new host. On leaves of *Zygophyllidium bilobatum* (Engelm.) Standley: Santa Rita, Aug. 1, 1911, *J. M. Holzinger;* a new host. To be expected in New Mexico upon the following hosts upon which it is reported elsewhere: *Chamaesyce albomarginata, C. Fendleri, C. Geyeri, C. lata, C. petaloidea, C. serpens, Dichrophyllum marginatum,* and *Poinsettia dentata.*

UROMYCES PSORALEAE Peck

On leaves and stems of *Psoralea micrantha* A. Gray: Dulce, Aug. 19, 1911, *Standley 8069.*

UROMYCES RUDBECKIAE A. & H.

On leaves of *Rudbeckia laciniata* L.: Brazos Canyon, Aug. 25, 1914, *Standley & Bollman 10818.*

UROMYCES SILPHII (Burrill) Arthur

On *Juncus longistylis* Torr.: Costilla Valley, Sept. 6, 1913, *Wooton.* On *Juncus interior* Wiegand: McKinney's Park, Socorro Co., Aug. 23, 1903, *Metcalfe.*

UROMYCES SPECIOSUS Holway

The type was collected by Holway at Cloudcroft, New Mexico, on *"Frasera macrophylla."* Examination of a portion of the type collection forwarded to the writer by Dr. Arthur shows that the host is *Frasera speciosa* Dougl.

UROMYCES TRANZSCHELII Syd.

On leaves of *Tithymalus* sp.: Near Fairview, July 18, 1904, *Wooton.*

UROPYXIS AMORPHAE (M. A. Curt.) Schröt.

On *Amorpha nana* Nutt.: [Las Vegas?] Hot Springs, Sept. 13, 1896, *E. W. D. Holway* (*Bartholomew 772*). On *Amorpha cali-*

fornica Nutt.: Las Cruces, Oct. 27, 1892, *Wooton;* west of Roswell, Aug. 30, 1900, *Earle 377.* The species occurs elsewhere on *Amorpha canescens* and may occur in New Mexico on that host.

UROPYXIS PETALOSTEMONIS (Farl.) De Toni

II. On stems and leaves of *Petalostemum oligophyllum* (Torr.) Rydb.: Pecos, Aug. 15, 1908, *Standley 4960.* To be expected in New Mexico upon *P. purpureum,* since it is reported from other states upon that host.

UROPYXIS SANGUINEA (Peck) Arthur

On leaves of *Odostemon repens* (Lindl.) Cockerell: Chama, July 10, 1911, *Standley 6767;* Winsor's Ranch, June 30, 1908, *Standley 4085;* Dulce, Aug. 20, 1911, *Standley 8181;* Brazos Canyon, Aug. 30, 1914, *Standley & Bollman 10937.*

UROPYXIS WOOTONIANA Arthur

II, III. On leaves of *Odostemon haematocarpus* (Wooton) Heller: Organ Mts., Dec. 23, 1903, *Wooton* (type); Filmore Canyon, Organ Mts., Nov. 9, 1908, *Wooton;* Queen, Aug. 1, 1909, *Wooton.* The species might well be expected on a closely related species occurring in New Mexico, *Odostemon Fremontii.*

USTILAGINALES

(Determined by Dr. G. P. Clinton, unless otherwise noted)

CINTRACTIA CARICIS (Pers.) Magn.

On *Carex* sp.: Winsor's Ranch, July 3, 1908, *Standley 4161;* Chama, July 10, 1911, *Standley 6778.*

ENTYLOMA AUSTRALE Speg.

On *Physalis neomexicana* Rydb.: Pecos, Aug. 19, 1908, *Standley 5100.* Determined by Sumstine.

ENTYLOMA COMPOSITARUM Farl.

On *Bidens tenuisecta* A. Gray (a new host): Pecos, Aug. 19, 1908, *Standley 5097*. Determined by Wilson.

SOROSPORIUM CONSANGUINEUM Ellis & Ev.

On *Aristida* sp.: Mesa west of the Organ Mts., Oct. 6, 1904, *Wooton 3794*. Dr. Clinton states that the spores are larger than in the type; consequently the determination is somewhat doubtful.

SOROSPORIUM CONTORTUM Griff.

On *Heteropogon contortus* (L.) Beauv.: Agricultural College, Oct. 5, 1904, *Wooton;* mesa west of Organ Mts., Oct. 15, 1904, *Wooton 3791*. Reported previously only from Arizona and from Jalisco, Mexico.

THECAPHORA DEFORMANS Dur. & Mont.

On *Astragalus Wootoni* Sheld.: Range Reserve, Dona Ana Co., May 14, 1913, *Wooton;* a new host. Reported from adjacent states upon *Astragalus bisulcatus, A. Drummondii, A. Nuttallianus,* and *A. missouriensis,* all of which occur in New Mexico.

TILLETIA ASPERIFOLIA Ellis & Ev.

On *Sporobolus asperifolius* (Nees. & Mey.) Thurb.: Ojo Caliente, Zuni Reservation, July 28, 1904, *Wooton*.

TOLYSPORELLA (?) NOLINAE Clinton

On *Nolina microcarpa* S. Wats.: Near San Luis Pass, southwestern corner of New Mexico, June 21, 1906, *Wooton*. Reported previously only from the type locality, the Rincon Mts., Arizona.

UROCYSTIS AGROPYRI (Preuss) Schröt.

On *Elymus canadensis* L.: Ojo Caliente, Zuni Reservation, July 28, 1904, *Wooton*. Reported by Clinton (N. Am. Fl. 7: 58. 1906) from New Mexico on *Agropyron occidentale* (=*A. Smithii* Rydb.).

UROCYSTIS ANEMONES (Pers.) Wint.

Reported from New Mexico on *Pulsatilla hirsutissima* (Pursh) Britton by Clinton (N. Am. Fl. **7**: 55. 1906).

USTILAGO AVENAE (Pers.) Jens.

On *Avena sativa* L.: Shiprock, Aug. 11, 1911, *Standley 7870,* in part; Ponchuelo Creek, July 30, 1908, *Standley 4592.*

USTILAGO BROMIVORA (Tul.) Fisch. de Waldh.

On *Bromus polyanthus* Scribn.: Pecos, Aug. 25, 1908, *Standley 5317.*

USTILAGO BUCHLOES Ell. & Tracy

The type (on *Bulbilis dactyloides*) was collected at Coolidge (now known as Guam), New Mexico. The species is reported also from Nebraska.

USTILAGO CALCARA Griff.

The type was collected at Roswell, New Mexico, May 4, 1903, on *Bouteloua breviseta* Vasey. The species is reported only from this state.

USTILAGO HIERONYMI Schröt.

On *Bouteloua eriopoda* Torr.: East of Dona Ana Mts., Sept. 6, 1908, *Wooton;* mesa west of Organ Mts., Oct. 25, 1904, *Wooton.* On *Bouteloua breviseta* Vasey: Roswell, according to Griffiths (Bull. Torrey Club **31**: 87. 1903; Clinton, N. Am. Fl. **7**: 13, 1906). Also reported by Clinton (l. c.) from New Mexico on *Bouteloua oligostachya* (= *B. gracilis* (H. B. K.) Lag.). The species occurs in adjacent regions on *Bouteloua curtipendula* (Michx.) Torr., *B. aristidoides* (H. B. K.) Griseb., *B. barbata* Lag., *Dasyochloa pulchella* (H. B. K.) Willd., and *Pappophorum Wrightii* Munro, all of which are found in New Mexico.

USTILAGO HILARIAE Ellis & Tracy

On *Hilaria mutica* (Buckl.) Benth.: East of Dona Ana Mts., Sept. 6, 1908, *Wooton*. The type was collected at Albuquerque, New Mexico, on *Hilaria Jamesii* (Torr.) Benth.

USTILAGO HORDEI (Pers.) Kellerm. & Swingle.

On cultivated barley: Mora, Aug. 11, 1910, *Wooton*.

USTILAGO HYPODYTES (Schlecht.) Fries

On *Stipa Vaseyi* Scribn.: Pecos, Aug. 22, 1908, *Standley 5189;* Raton Mts. (Griffiths, Bull. Torrey Club **31**: 86. 1903). On *Distichlis spicata* (L.) Greene; Roswell (Griffiths, op. cit. 87. 1903). Reported from adjacent states on *Oryzopsis hymenioides* (R. & S.) Ricker and *Sporobolus cryptandrus* (Torr.) A. Gray, two grasses abundant in New Mexico.

USTILAGO LEVIS (Kellerm. & Swingle) Magn.

On *Avena sativa* L.: Shiprock, Aug. 11, 1911, *Standley 7870,* in part; Pecos, Aug. 19, 1908, *Standley 5075;* Farmington, July 18, 1911, *Standley 7051.*

USTILAGO MUHLENBERGIAE P. Henn.

The type was collected at [Las Vegas?] Hot Springs, New Mexico, on "*Muhlenbergia Pringlei.*" That species is not known to occur in New Mexico. The same smut is reported from Arizona on *Muhlenbergia Porteri* Scribn., a species common in New Mexico.

USTILAGO ZEAE (Beckm.) Unger.

On cultivated maize: Pecos, Aug. 25, 1908, *Standley 5287.*

AGARICALES

AGARICUS CAMPESTRIS L.

Reported by Cockerell from Pecos.

CLAUDOPUS NIDULANS (Pers.) Peck

On spruce log: Brazos Canyon, Sept. 2, 1914, *Standley & Bollman 11059*. Determined by Murrill.

COPRINUS ATRAMENTARIUS (Bull.) Fries

Reported from Pecos by Cockerell.

COPRINUS MICACEUS (Bull.) Fries

Reported from Pecos by Cockerell.

CORIOLUS ABIETINUS (Dicks.) Quél.

On spruce log: Brazos Canyon, Sept. 7, 1914, *Standley & Bollman 11184*. On dead fir: Brazos Canyon, Aug. 30, 1914, *Standley & Bollman 10897*. Determined by Murrill.

CORIOLUS LIMITATUS (Berk. & Curt.) Murrill

[*Trametes limitata* Berk. & Curt.]

The type is said to have been collected in New Mexico by Bigelow. It may, however, have come from Arizona, as Bigelow did not distinguish the two states.

CORIOLUS VERSICOLOR (L.) Quél.

Lookout Mine, Sierra Co., June 14, 1904, *O. B. Metcalfe*. Determined by Murrill.

FOMES ELLISIANUS F. W. Anders.

Reported from New Mexico by Murrill (N. Am. Fl. 9: 98. 1908). It grows upon living branches of *Lepargyrea argentea* (Nutt.) Greene.

HYPHOLOMA PECOSENSE Cockerell

The type was collected at Pecos, June, 1903, by Dr. M. Grabham.

POLYPORUS ARCULARIUS (Batsch) Fries

Reported from Pecos by Cockerell.

PYROPOLYPORUS EARLEI Murrill

The type was collected by Earle, August, 1900, on "a standing trunk of *Juniperus,*" in the Capitan Mts.

PYROPOLYPORUS IGNIARIUS (L.) Murrill

Collected in New Mexico by Earle (probably in the Capitan Mts.) according to Murrill (Bull. Torrey Club **30**: 111. 1903).

PYROPOLYPORUS PRAERIMOSUS Murrill

The type was collected by Earle, July, 1900, "on *Quercus undulata,*" in the Capitan Mts., at an altitude of 2100 meters.

STROPHARIA STERCORARIA Fries

A specimen so determined by Mrs. F. W. Patterson was collected at Pecos by Cockerell.

LYCOPERDALES

BATTAREA LACINIATA Underw.

The type was collected at Mesilla Park by Cockerell.

CHLAMYDOPUS CLAVATUS Speg.

Three collections from Las Cruces and Mesilla Park are reported by White (Bull. Torrey Club **28**: 437. 1901).

CYATHIA HIRSUTA (Schaeff.) White

Brazos Canyon, Aug. 26, 1914, *Standley & Bollman 10837.* Determined by Murrill.

GEASTER FLORIFORMIS Rit.

Reported from Las Vegas Hot Springs by Cockerell.

GEASTER HYGROMETRICUS Pers.

Reported from Soledad Canyon, Organ Mts., by Cockerell.

TYLOSTOMA FIMBRIATUM Fries

White (Bull. Torrey Club **28**: 434. 1901) reports a specimen collected in New Mexico by Wright. The collection may have come from New Mexico, or it may have been collected in Arizona, Sonora, Chihuahua, or western Texas, for many of Wright's plants labeled "New Mexico" came from those four states.

TYLOSTOMA GRACILE White

The type was collected at Las Cruces by Wooton.

TYLOSTOMA PEDUNCULATUM (L.) Schröt.

Reported from New Mexico (3 collections without specific localities) by White (Bull. Torrey Club **28**: 429. 1901).

SPHAEROPSIDALES

(Determined by Dr. David R. Sumstine, unless otherwise noted.)

AMPELOMYCES QUISQUALIS Cesati

On *Erysiphe Cichoracearum* on *Mertensia* sp.: Brazos Canyon, Aug. 25, 1914, *Standley & Bollman 10797*. On *Erysiphe Cichoracearum*? on *Phacelia heterophylla* Pursh: Beatty's Cabin, Aug. 8, 1908, *Standley*. Determined by Wilson.

DARLUCA FILUM (Biv.) Cast.

Las Vegas (*Cockerell*). Determined by Earle.

DIDYMARIA CLEMATIDIS Cooke & Hark.

On *Clematis ligusticifolia* Nutt: Ensenada, Sept. 3, 1914, *Standley & Bollman 11078*. Determined by Wilson.

PHOMA LUPINI Ellis & Ev.

On *Lupinus aduncus* Greene: Tunitcha Mts., Aug. 8, 1911, *Standley 7827*. Determined by Fairman.

PHYLLOSTICTA ATRIPLICIS Desm.

On *Chenopodium album* L.: Pecos, Aug. 15, 1908, *Standley 5024*.

PHYLLOSTICTA CRUENTA Tr.

On *Vagnera amplexicaulis* (Nutt.) Morong: Winsor Creek, Aug. 4, 1908, *Standley 4751*.

PHYLLOSTICTA SYMPHORICARPI Wint.?

On *Symphoricarpos oreophilus* A. Gray: Brazos Canyon, Aug. 30, 1914, *Standley & Bollman 10928* (immature).

SEPTORIA EMACULATA Peck & Clinton

On *Lathyrus decaphyllus* Pursh: Pecos, August, 1908, *Standley*.

SEPTORIA PISI Westd.

On *Pisum sativum* L.: Pecos, Aug. 22, 1908, *Standley 5183*. Determined by Wilson.

SEPTORIA POLYGONORUM Desm.

On *Polygonum buxiforme* Small: Pecos, Aug. 21, 1908, *Standley 5157*.

SEPTORIA RIBIS Desm.

On *Ribes inebrians* Lindl.: Dulce, Aug. 19, 1911, *Standley 8097*.

SEPTORIA RUDBECKIAE Ellis & Hark.

On *Ratibida columnifera pulcherrima* (DC.) Woot. & Standl.: Pecos, Aug. 25, 1908, *Standley 5293*.

MONILIALES

(Determined by Dr. David R. Sumstine.)

CLADOSPORIUM HERBARUM (Pers.) Link

On *Dugaldea Hoopesii* (A. Gray) Greene: Chama, July 10, 1911, *Standley 6761*. On *Quercus* sp.: Brazos Canyon, Aug. 31,

1914, *Standley & Bollman 10988.* On *Lepargyrea canadensis* (L.) Greene: Brazos Canyon, Aug. 31, 1914, *Standley & Bollman 10987.*

MACROSPORIUM SOLANI Ell. & Mart.

On cultivated canteloupe: Mangas Springs, Aug. 11, 1902, *Wooton.*

MICROSTROMA ALBUM (Desm.) Sacc.

On *Quercus* sp.: Durfey's Well, July 19, 1904, *Wooton 3744.*

MICROSTROMA JUGLANDIS (Bereng.) Sacc.

On *Juglans major* (Torr.) Heller: 10 miles north of Hermosa, July 15, 1904, *Wooton 3749.*

POLYTHRINCIUM TRIFOLII Kunze

On *Trifolium repens* L.: Near Ensenada, Sept. 3, 1914, *Standley & Bollman 11082.*

RAMULARIA DECIPIENS Ellis & Ev.

On *Rumex crispus* L.: Pecos, Aug. 25, 1908, *Standley 5300.*

RAMULARIA GRINDELIAE E. & K.

On *Grindelia aphanactis* Rydb.: Pecos, Aug. 25, 1908, *Standley 5302.*

RAMULARIA SAMBUCINA Peck

On *Sambucus microbotrys* Rydb.: Beatty's Cabin, Aug. 8, 1908, *Standley 4841.*

TRICHOTHECIUM ROSEUM Fries

Reported by Cockerell from Mesilla, on dead wood of *Sambucus mexicana* Presl.

TUBERCULARIA VULGARIS Tode

Reported by Cockerell from Placita, near Las Vegas, on *Padus melanocarpa* (A. Nels.) Shafer.

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NOTE ON WESTERN RED ROT IN PINUS PONDEROSA

W. H. Long

In the National Forests of Arizona and New Mexico, a varying percentage of the trees of western yellow pine (*Pinus ponderosa*) is affected by a heart-rot, known locally as "red heart," "red rot," "gray rot," "top rot," and "heart rot." The amount of this rot present varies materially with the exposure, slope, and soil on which the yellow pine is growing, as well as with the age of the timber itself.

This heart-rot is called in this paper "western red rot" in order to distinguish it from the true "red heart" or "red rot," a very similar heart-rot common in many species of conifers. True "red rot" or "ring scale" is caused by *Trametes pini*, while "western red rot" is produced by an entirely different fungus.

Western red rot has three stages in its development: (1) An initial stage in which the affected heartwood is firm but shows reddish to dark brown discolored areas; (2) an intermediate stage in which the diseased heartwood is whitish or gray in color and is more or less delignified; and (3) a final stage in which much of the heartwood has disappeared due to the absorption of the delignified portions, while the wood particles left are brittle and easily crumble when handled.

The fungus which causes "western red rot" never forms brown, woody, perennial fruiting bodies on the boles of living affected pine trees as *Trametes pini* does, but forms annual fruiting bodies which usually develop as white encrusting layers on the underside of logs. However, fruiting bodies have been found which have distinct and well-formed pilei. The pileate form of the fungus resembles very closely *Polyporus Ellisianus* (*Tyromyces Ellisianus* of Murrill in North American Flora) and is probably this species.

Western red rot is exceedingly common throughout the western yellow pine regions of Arizona and New Mexico. Specimens of the fungus have also been examined from Vermont, New Jersey, Washington, and Idaho, while a photograph of the rot in western yellow pine has been seen from South Dakota. It is therefore highly probable that the fungus is widely distributed throughout the western states and to a limited extent at least in the northeast.

The western red rot fungus enters the living tree through the heartwood of dead branches in the crown. It first attacks the sapwood of the dead branch, then the heartwood; it then travels down the dead branch into the heartwood of the living tree.

In order to throw some light on the presence of western red rot in western yellow pine and its probable influence on the rotation period, studies were conducted on certain areas in the Santa Fe National Forest, N. Mex., where both tie trees and sawtimber were being cut. These areas were especially suitable for a study of this character, since an unusually large percentage of the black jack (30 to 50 per cent.) and nearly all of the yellow pine (85 to 100 per cent.) were being cut. A marked difference was found in the percentage of black jack (young western yellow pine before it reaches the age of 125 to 150 years) and of yellow pine affected by western red rot on these areas. Of 1815 felled merchantable black jacks examined, only 29 or 1.59 per cent. had this rot, while out of 563 yellow pines, 77 or 13.6 per cent. were attacked by it. The above data show that during the black jack period, the trees are practically free from western red rot but as they grow older, the increasing number of dead branches make them more subject to the attacks of the fungus.

On the areas examined, western yellow pine trees up to 125 to 150 years old were rarely attacked by western red rot, while trees over 200 years old showed a much higher percentage of rot than the younger trees (black jack). It therefore follows that a short rotation will be better for the future health of the forest as far as heart rots are concerned than a long one. It is a fundamental fact that the older a tree is, the more liable it is to be attacked by heart-rotting fungi.

It was also found that western yellow pine trees growing on very thin soil, on steep south or east slopes where growth conditions are poor have a higher percentage of western red rot than trees situated where the growth conditions are good.

OFFICE OF INVESTIGATIONS IN FOREST PATHOLOGY,
BUREAU OF PLANT INDUSTRY,
ALBUQUERQUE, N. MEX.

INTERNAL UREDINIA[1]

J. F. Adams[1]

(With Plate 186, Containing 2 Figures)

The spores of the Uredinales are developed usually in sori just below the cuticle or epidermal layer and are liberated by early rupturing or by the weathering away of the overlying tissue in the case of some resting spores. There are deviations from this development in certain resting spores which are sometimes buried singly in the host tissues which are dependent for liberation also upon the weathering away of the overlying tissues. Exception to the usual development of sori has been reported by Wolf, Reddick, Edgerton, and others.

Internal aecia were first reported by Wolf[2] in *Puccinia angustata* Peck upon *Lycopus virginicus* L., as appearing in the younger tissues of the stem or petiole, being similar in origin, structure, size, and form to those which are erumpent at maturity. Atkinson and Edgerton[2] have observed *Nigredo Caladii* (Schw.) Arth. (*Uromyces Caladii* Farl.) to form internal cluster cups in *Peltandra virginica* (L.) Kunth and Reddick[2] has observed them in the fruits of barberry.

Internal uredinia of *Dicaeoma poculiforme* (Jacq.) Kuntze (*Puccinia graminis* Pers.) liberating the urediniospores into the interior of the hollow stem of rye have been observed by Reddick.[2] Another aberrant case has been found in the production of internal uredinia of *Nigredo caryophyllina* (Schrank.) Arthur (*Uromyces caryophilinus* Schröter) in the leaves of *Dianthus caryophyllus* L. Specimens of the rust-infected leaves were collected from plants growing in the greenhouse of the Pennsylvania State College. The leaves are succulent and are favorable

[1] Contribution from the Department of Botany, Pennsylvania State College, No. 4.

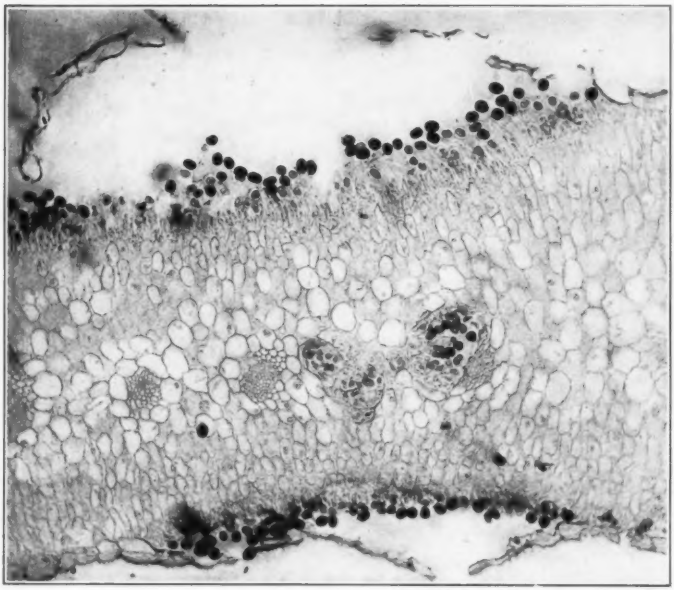
[2] Wolf, F. A., Internal Aecia, Mycologia, Vol. V, No. 6.

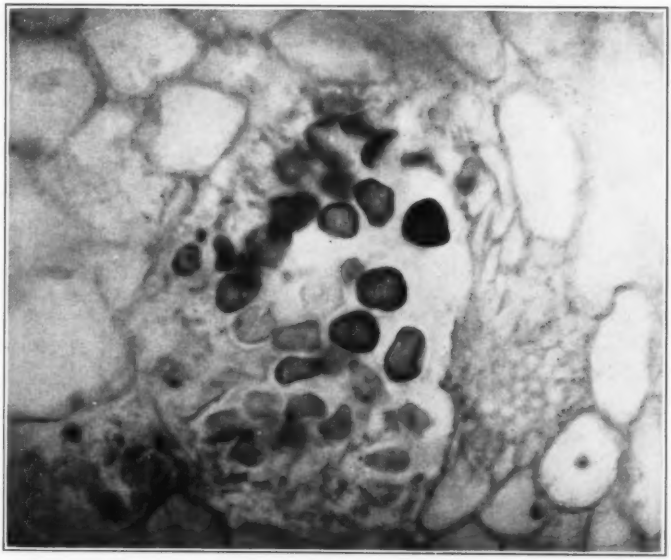
for wide ramification of the rust mycelium. In many instances, the uredinia are found to rupture on opposite surfaces of the leaves and under such conditions internal uredinia were found in the central portion of the mesophyll and occurred as well-developed sori with mature spores. In some instances they were observed to develop adjacent to the bundle tissues.

The mycelium of the internal sori was abundant and could be traced easily to the subepidermal sori. The internal sori appear somewhat spherical and the mycelium produces rather a pseudoparenchymatous layer crowding the adjacent cells of the mesophyll. In some sections, pockets or masses of mycelium were found which evidently were immature sori. The matured spores were similar in size and color to those produced subepidermally.

Since the development of the uredinial stage is supposed to be subepidermal as a rule, this deviation seems worthy of note. Such a deviation from the usual method probably represents an abnormal rather than a typical condition. In this species the development of the internal uredinia is favored by the abundant mycelium from the upper and lower subepidermal sori and by the texture of the leaf which allows wide ramification of the rust mycelium.

STATE COLLEGE, PA.





CROSS SECTION OF CARNATION LEAF WITH THREE INTERNAL SORI, ONE OF WHICH IS ENLARGED IN THE LOWER FIGURE

NOTES AND BRIEF ARTICLES

Mr. A. S. Rhoads, assistant in forest botany at Syracuse University, visited the Garden April 20–23 to consult the collection of Polyporaceae in the mycological herbarium.

Mr. C. C. Hanmer, of East Hartford, Connecticut, has sent in a very interesting specimen of *Russula flava* Romell collected by him at Kineo, Maine, in August, 1911. The specimen grew alone beneath a log covered with clusters of *Armillaria mellea* and one of the "shoestring cords" of this fungus came in contact with the moist upper surface of the *Russula* and developed a tiny hymenophore of the *Armillaria,* which in the dried state is nearly 2 cm. high. Spores from the *Armillaria* clusters fell plentifully upon the *Russula* and the stipe of the young *Armillaria* was partly imbedded in the surface of the *Russula,* strongly suggesting to Mr. Hanmer at first glance that it had developed in some unusually rapid way from one of these spores. A tiny bit of black "cord" projecting from the base of the young stipe tells the story. It might be interesting to students to follow this up with a few experiments.

The subject of edible mushrooms has become very popular of late and many inquiries have been received regarding reliable literature. It can now be stated that there is in press and very soon to appear a large colored chart and a descriptive handbook containing the principle edible and poisonous species of fungi found in America. It is hoped that much safe and useful information will be disseminated by means of this long desired publication.

A New Species of Colus from Pennsylvania

Colus Schellenbergiae Sumstine, sp. nov.

Volva dark-brown, smooth, globose, 2–3 cm. in diameter, breaking at maturity into several irregular segments; receptaculum

stipitate, the stipitate portion cylindric, hollow, reticulate-pitted, white below, orange-colored above, slightly enlarged upward, dividing into three arms; arms arched outward, united at the apex, transversely wrinkled, cylindric or sometimes compressed so as to appear triquetrous, orange-colored, attenuate upward, 3–6 cm. long; gleba dark-green, borne on the inner side of the arms, foetid; spores hyaline, ellipsoid-ovoid, 4.5–5.5 $\mu \times 2$–2.5.

Growing in the yard of Mrs. F. F. Schellenberg, Pittsburgh, Pa., July, 1915. Type specimens have been deposited in the Carnegie Museum, Pittsburgh, Pa., and in the New York Botanical Garden. Plants developed from eggs removed from the ground had very long arms, but the stipitate portion of the receptaculum was very short. The description of *Colus javanicus* Penzig agrees in a general way with my plants. The former are smaller. I do not have access to the original description, and Saccardo in the *Sylloge* does not give the color of *C. javanicus*, so I have not been able to compare the two species with respect to color.

DAVID R. SUMSTINE.

REVIEW OF KNIEP'S BEITRÄGE ZUR KENNTNIS DER HYMENOMYCETEN, III[1]

Kniep in his previous report[2] on the question of the origin of the binucleated cells in the Basidiomycetes mentioned the appearance of small bodies in the clamp connections which appeared to him to be disintegrating nuclei. In his present paper he makes these indefinite bodies the basis of a new theory in explanation of how the binucleated cells in the Basidiomycetes arise. In accordance with his new view, he accepts the fact that the binucleated cells arise before the anlage of the carpophore is formed. While his previous observations are correct, he now interprets them as abnormalities. The present article deals with a cytological study of *Corticium varians* sp. nov. and *Corticium serum* Pers. These species have a single nucleated spore and the nucleus divides after the spore germinates. A young mycelial cell has but a single nucleus but at the time a clamp connection is formed the nucleus

[1] Kniep, Hans, Bot. Zeit. **7**: 369–398, *pl. 2, fig. 1–20.*

[2] Kniep, Hans, Beiträge zur Kenntnis der Hymenomyceten I, II. Bot. Zeit. **5**: 594–637, *pl. 2–4, f. 1.* 1913.

divides. Kniep holds that the clamp is budded from the mycelial cell at some point between the two nuclei. So soon as the clamp is sufficiently large one of the nuclei moves into it while the other comes to lie near its base. Conjugate division of the nuclei now takes place. The daughter nuclei arrange themselves so that two non-sister nuclei move to the apical portion of the cell, one remains in the basal portion while the fourth is left in the clamp connection. Kniep finds that the cross wall of the mother cell does not appear until after the clamp has budded out and that it is formed directly below the origin of the clamp connection. Later a second wall appears at the base of the clamp separating it from the apical cell. The result of these processes is a binucleated apical cell, a uninucleated basal cell, and the clamp with a small nucleus. Fusion of the basal cell and the clamp connection now takes place and the nucleus of the clamp connection passes into the basal cell. Thus making the basal cell also binucleated. When a branch is formed, practically the same sequence of phenomena occurs. One nucleus remains in the mother cell, the other migrates to the new branch and a clamp connection is formed between them. In old mycelial cells fusion of the clamp connection and the basal cell takes place quite regularly. Kniep found this peculiar type of conjugate division also in *Panus stipticus, Clitocybe flaccida,* and *Polyporus destructor,* but unfortunately he gives no figures in spite of the fact that these forms have been studied by other cytologists who failed to find such divisions.

Kniep also takes up the question of the phylogenetic significance of the clamp connection. Kniep claims that the binucleated mycelial cells are the homologues of the ascogenous hyphae. He also contends that the penultimate cell of the ascogenous hyphae is the homologue of the apical mycelial cell, and the clamp connection is the homologue of the end cell in an ascogenous hypha. The question that naturally suggests itself is: Does the apical mycelial cell of the Basidiomycetes become the basidium as the penultimate cell becomes the ascus in the Ascomycetes? Kniep claims to have traced the hyphae in a number of forms and found that there is a clamp connection between every two adjacent binucleated cells and there is likewise a clamp connection at the base of each basidium. But in *Lactarius piperatus* Scop., *Tricho-*

loma imbricatum Quél., and *Amanitopsis vaginata* Roze, no such clamp connections appear. According to Harper (Bot. Gaz. 1902), there are no clamp connections between the basidia and the subhymenial cells in *Hypochnus subtilis* and *Coprinus ephemerus.* Buller (Researches on Fungi, 1909) figures no clamps at the bases of the basidia in a number of *Coprinus* species. My own studies on *Coprinus micaceus, C. ephemerus,* and *C. stercorarius* (unpublished) fail to show clamp connections on the basidia of these forms. In over twenty species of Boleti (Bull. Torr. Club, 1913) no clamp connections were observed on the basidia. Yates's figures of his histological studies of certain Boletaceae (Univ. Calif. Publ. 1916) also show no clamp connections.

Kniep fails to trace the hyphae in the trama and to tell definitely whether or not he found clamp connections in these hyphae. Kniep's theory of the clamp cell is not supported by sufficient evidence and it still remains to trace out the origin and the history of the binucleated hyphae through to the basidia. This undoubtedly will clear up many questions on the morphology of the higher Basidiomycetes. MICHAEL LEVINE.

A VERY DANGEROUS MUSHROOM

The poisonous mushroom described below was brought to me for critical examination on May 1, 1916, by Mrs. Rufus Hatch, of Pelham Manor, New York. It grew plentifully in her mushroom beds the past winter, almost to the exclusion of the common cultivated mushroom, and was eaten by Mrs. Hatch and four members of her household with nearly fatal results. A full description of the effects will be published; but it is considered important to send out a warning immediately that *poisonous mushrooms may apparently develop from commercial spawn and that growers must be careful to eat or sell from their mushroom beds only the common mushroom with white cap and pink gills, Agaricus campester.*

Panaeolus venenosus sp. nov.

Pileus thick, fleshy, hemispheric when very young, sometimes hatshaped, at length expanded, cespitose, 3–5 cm. broad; surface

moist, slightly viscid when very young, hygrophanous, bay becoming fulvous or isabelline according to age and moisture conditions, glabrous, smooth on the umbo, rugose and folded on the broad rim when in the hat-like stage; margin entire to lobed, not projecting, smooth, entirely free from fibrils or remnants of a veil, incurved when young, marked with a water-soaked, dark-fulvous zone about 3 mm. broad; context white or slightly yellowish, very thick at the center and very thin toward the margin, the odor and taste resembling that of the common mushroom; lamellae squarely adnate, without sinus or decurrent tooth, plane, somewhat semicircular in shape, at least when young, inserted, fuliginous, gray or whitish on the edges, not distinctly marbled, purplish-fuliginous when viewed from below, of medium distance, about 8 mm. broad; spores ellipsoid or ovoid, somewhat pointed or narrowed at both ends, black, smooth, opaque, 11–13 $\times$ 7–8.5 μ; cystidia not found; stipe thick, fleshy, sometimes equal but often much enlarged upward, whitish or rosy-isabelline, not polished, longitudinally striate at the apex, whitish, pruinose above, whitish-tomentose below, conspicuously hollow, 6–10 cm. long, 5–10 mm. thick.

Type collected by Mrs. Rufus Hatch in her mushroom beds at Pelham Manor, New York, May 1, 1916 (herb. N. Y. Bot. Gard.).

At first sight, the specimens suggested the genus *Psilocybe*, since the gills were purplish-brown and the margin did not project beyond them; but the spore-print proved to be black and the spores typically those of the genus *Panaeolus*. The species is aberrant and might be placed in a different group or subgroup with species like *Panaeolus digressus* Peck and *Panaeolus acidus* Sumstine. Other species of *Panaeolus* have been considered somewhat poisonous, but apparently none have exhibited such poisonous properties as this.

W. A. MURRILL.

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